Background Material for

Training Programme for IAS Officers on Management of the Environment

November 13-17, 1995

at
India International Centre
40, Lodhi Estate, New Delhi-110003

Tata Energy Research Institute
Darbari Seth Block, Habitat Place
Lodhi Road, New Delhi-110003

2 STATUS OF THE ENVIRONMENT

2.01 The establishment of a diversified industrial structure, based on a unique combination of heavy and small-scale industries and the growing urban and rural population in India has produced its pressures on air, water and land resources. These pressures are reflected in the growing incidence of air and water pollution. The fact that the Factories Act of 1948 with its accent on occupational and civic safety had to be supplemented by the more specialised Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution Act (1981) and much later the Environment (Protection) Act of 1986 is an unmistakable sign of the impact of pollution on air and water resources. The Central Pollution Control Board (CPCB) constituted under the Water (Prevention and Control of Pollution) Act, 1974 in September, 1974 has inventorised the pollution sources, and assessed the air and water pollution potential on terms of industries, river basins and geographical areas.

2.02 Coming to the scenario of air and water quality in India it is seen that the pollution load in respect of air is of a relatively high order in the metropolitan cities of Delhi, Bombay, Calcutta and Madras. The CPCB which conducted ambient air quality monitoring of Delhi has observed

relatively high frequency of suspended particulate matter, SO_2, NO_2 and heavy metals in particulate matter in the air in Delhi. The CPCB studies also indicate that the periods of April to June and from mid-October to March are environmentally critical for Delhi from the point of view of air pollution. The state of ambient air quality in the 15 major cities of India including Delhi during the year 1990, is summed up in Table 1.

2.03 In non-metropolitan areas, the CPCB has identified 22 problem zones in India which are most prone to industrial pollution in the country. These are Korba in Madhya Pradesh, Talcher in Orissa, Visakapatanam in Andhra Pradesh, Manali in Tamil Nadu, Udyogamandalam in Kerala, Chembur in Maharashtra and Najafgarh in Delhi, Dhanbad in Bihar and Durgapur in West Bengal

2.04 The pollution problems of small towns in India basically relate to water. A survey undertaken by the CPCB in respect of 241 Class II Towns in 17 States of India indicates that on an average, 90% of the water supplied is polluted. Only 1.6% of the 'polluted', wastewater gets treated.Table 2 sums up the salient findings in this regard.

2.05 Rivers in India are also faced with increasing water quality deterioration. The details of the grossly polluted stretches of six major rivers in India have been captured on Table 3 along with the sources,

nature and load pollution It is however worthy of note from Table 3 that while the Godavari, Krishna and Indus rivers owe their pollution load predominantly to industrial activities, the other rivers have both municipal/ domestic and industrial wastes as pollution sources. Indeed, according to the study of water pollution in the Ganga basin (which forms the focus of the major Ganga Action Plan of India) it is estimated that 3/4th by volume of the waste water generated is from Municipal sources, 88% of the municipal sewage being from Class I cities.

2.06 In respect of different industries, air and water pollution problems are critical in respect of fertilisers, paper and pulp, sugar and thermal power plants/industries. The status of air and water pollution by selected highly polluting categories of Industries in India in 1989-90 are depicted in Fig 1 and 2 respectively. As can be seen, while the fertilizer industries were defaulters in meeting air pollution standards, sugar and pulp and paper formed the major defaulters in the matter of non-compliance with minimum in water/liquid effluent standards. This picture is changing with the enforcement of standards and increasing adoption of pollution control technologies by industrial units coming under the critically polluting categories

2.07 The incidence of noise pollution has been on the rise especially in

big cities of India such as Delhi. Ambient noise levels in 25 different locations comprising sensitive, residential, commercial, and traffic areas of Delhi during May-June, 1989 were far in excess of the permissible standards laid down for noise levels. The noise levels for industrial units were well below the standards of 75 dB.

2.08 The rapid growth of chemical, petro-chemicals, fertilizer and engineering industries in India from the Second Five Year Plan has increased the incidence of use of toxic, flammable and explosive chemicals in India. The Bhopal Gas tragedy has brought out the significance of scientific safe and regulated manufacture, storage and import of hazardous/toxic chemicals. The Hazardous Wastes (Management and Handling) Rules, 1989 notified in 1989 cover 18 types of hazardous wastes while the Manufacture, storage and import of Hazardous Chemical Rules, 1989 list 434 toxic flammable and explosive chemicals for careful regulation. Yet there have been instances of industrial accidents such as the explosion at the IPCL Nagathone gas cracker. Of the 21 petrochemicals (other than polymers and synthetic fibres) identified for vigorous growth by 2000 A.D. Ethylene Oxide, Phenol, Acetone, Benzene and Toluene are listed as hazardous chemicals in Part II of Schedule I of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989.

The task of regulating these chemicals is formidable. There is also bound to be a spurt in the use of Hydrogen Cyanide, Carbon di Sulphide, Thionyl Chloride, Phosgene, Ammonia, Chlorine, Oleum and Hydrogen Fluoride.

2.09 Flyash, phospho-gypsum, and iron and steel slags are the principal forms of solid wastes generated in India. It is estimated that 35 to 40 million tonnes of flyash is generated annually by India's thermal power plants of which only 2% to 3% is now being utilized. The growing capacity of the fertilizer, iron and steel industries has also progressively increased the output of phospo-gypsum and slag wastes.

2.10 The description of the various forms and sources of air and water pollution and solid waste generation all indicate the somewhat precarious environmental health of the country not conforming with ambient air/noise and water quality standards. There are also effects on land and soil due to the increase in inorganic compounds and leaching and which also has effects on ground water resources. In general the following observations emerge regarding fresh water, coastal water and air quality in India:

Fresh Water Quality in Rivers

2.11 An analysis of the data collected from the 450 surface and groundwater quality sampling locations during the year 1990 were analysed. Observations emerging from the analyses are as follows :-

water quality data monitored under the Ganga Action Plan denotes total coliform as the critical parameter at all of the four locations in West Bengal. In Bihar, the same observation held for Patna and Buxar. In Uttar Pradesh, total coliform was observed to be critical at Kannauj, Kanpur, Allahabad and at Rasulabad and Varanasi;

Bio-chemical Oxygen Demand (BOD) was observed to be critical at the Kanpur, Allahabad and Varanasi stretches of the Ganga river;

total coliform was found to be critical in select segments of the Narmada, Mahi and Tapti rivers;

total coliform was found to be critical at all locations of the Subarnarekha, Tambiraparani and Damanganga rivers;

high levels of BOD were observed at Ludhiana and Jalandhar in Satluj (Punjab), downstream of Panposh in Brahmani, downstream of Nasik in Godavari, and at Sirumugai in Cauvery. However, DO at all locations was above 4 mg/1; and

there is an increased concentration of nitrate in the ground water in the vicinity of urban centres which renders it unfit for drinking. Also because of over pumping of ground water, the water levels in the sub-soil have diminished

Coastal Water Quality

2.12 Coastal and estuarine water resources in India depict the following quality characterstics:-

an exceptionally high concentration of lead and cadmium, 820 ug/1 and 336 ug/1 respectively, were observed in Thane creek of Bombay coast, while the mercury concentration is 0778 ug/1. The high levels of pollution particularly in Thane creek and Mahim creek are caused by the discharge of huge quantities domestic and industrial wastes. A major portion of the waste is released in Ulhas river and Bassein creek also. Sediment along the creeks and near-the-shore stations showed significant concentration of lead;

the Cochin region of the Kerala coast (South West Coastal Zones of India) is found to be most affected by petroleum hydrocarbons. During the pre-monsoon period, a concentration of 162 ug/1 was recorded in the estuarine area, while in the coastal area, the concentration recorded was 49 ug/1. This has been mainly due to the operation of oil tankers as well as the movement of mechanised fishing vessels. Further, it was also observed that the concentration of nutrients is high in the estuarine part, and that in the coastal & offshore regions being in descending order except for a few observations; and

along the coasts of West Bengal & Orissa, the coastal water quality remains almost stable. However, the Dissolved Oxygen (DO) was found near critical level in some localised area. Lead, cadmium and mercury were found in very low concentrations in the ambient water. The sediment samples were rich in metals, particularly lead.

Air Quality Data Analysis

2.13 Statistical analyses of air quality data pertaining to 1990 for various cities/towns covered by the National Ambient Air Quality Monitoring Stations (NAAQM) as presented in Tables 4 & 5 and the following are the major observations:

- except for the NAAQM location at Naskarpara Pump House, Howrah, the sulphur dioxide concentration at all other locations were within the stipulated air quality standards;

- except for the NAAQM location at Veterinary Hospital, Kota, the nitrogen dioxide concentration at all other locations were within the stipulated air quality standard;

- for sulphus dioxide, at 11 NAAQM locations in Ahmedabad, Bombay, Madras, Gajraula and Howrah, the violations over the 24-hourly

average standards were in the range of 5 percent. At locations in Madras, Calcutta and Howrah, the range of violations were 5-10 percent. Only Naskarpara Pump House in Howrah is the location where Sulphur Dioxide (19%) violated the 24-hourly average standard by more than 10%; and

the air component of the environment is degraded in very few locations. In metropoliton cities, exhaust from automobiles cause pollution in high-traffic density areas. To counter this problem, it is considered that strict standards for exhausts need to be laid down. Accordingly, such standards for 1995 and 2000 AD have been evolved. Emissions from industries are sought to be countered in a manner similar to wastewater discharge. Viewed in relative terms, there has been a qualitative improvement in water quality in the River Ganga, particularly in certain stretches. There are also reasons to suppose that the present status of air and water quality represents an improvement compared to the situation two years ago. For instance, the pollution control status of firms drawn from 17 categories of industries in 21 States and Union Territories indicate that for all categories there has been a discernible rise in the number of units complying with the MINAS (Minimum National Standards) for water/air pollution, December, 1991 and February, 1993 mainly due to effective implementation of the existing regulatory and fiscal regimes (Fig. 3).

Natural resources management

Virendra Kumar
Dr Zakir Hussain College

3 NATURAL RESOURCES

3.01 With a geographical area, spanning 329 million hectares, India is the seventh largest country in the world in terms of landmass. The systems and types of land use have been conditioned by climatic conditions, primarily expressed in terms of precipitation/rainfall received in various parts of the country. Rainfall in India is unequally distributed in space. The mean annual rainfall ranges from less than 100 mm in parts of the Rajasthan desert to more than 4000 mm in the Western Ghats portions of South West India and the North eastern parts of the country. The intra-annual distribution of precipitation is also uncertain and seasonally skewed. The bulk of rainfall is received during the South-west monsoon season (from June to September). However, even during this season there are periodic dry spells/droughts which are frequent in the arid and semi-arid zones of the country covering the States of Rajasthan, Gujarat, portions of Madhya Pradesh and the States of Maharashtra, Karnataka and Andhra Pradesh located in the Deccan area. Consequently, the crop yields of the rainfed sorghum-millet belt of arid and semi-arid India are subjected to periodic fluctuations.

3.02 The spatial diference in availability of precipitation is reflected in

the relative differences in the amounts of unit area runoffs from the various river basins of India both in intra and inter annual terms. The Central Water Commission (1988) places the average annual natural runoff available to India at 1880 billion cubic metres. The water storage structures created or under construction are able to store only 13.5% of the mean annual runnoff. Coming to groundwater resources, the estimate is that the replenishable groundwater resource in India(excluding the North-East) is 420 BCM/year of which 35-7 BCM/year is utilisable for irrigation against actual utilisation of only 106 BCM/year.

3.03 The unequal distribution of precipitation and water resources have conditioned agricultural cropping systems and systems of farming, though 'irrigation' has successfully transformed the water-short areas of Punjab, Haryana and Western Uttar Pradesh into the food bowls of India. Indeed there are sufficient indications that the agriculture frontier has stopped expanding. This is evident from the fact of net areas sown having increased from 119 million ha. in 1950-51 to 140 million ha. and stabilised at that level. (Table 6) In any case, an expanding agricultural frontier was not essentially environmentally conducive, since extension of cultivation to marginal lands had produced in its wake, problems of soil and water erosion. When this fact is related to the increase that has occured in the agricultural area subjected to double/multiple cropping (the area of

agricultural land sown more than once increased from 25,524000 ha.in 1971 to 36,770000 ha. in 1986-87), and the increase in food grain production by nearly 42 million tonnes in the period 1970-71 to 1985-86, it can be concluded that agriculture production in India is now based on the intensive margin i.e. modern technologies of production initiated during the Green Revolution of the late 1960s. But the spatial width of the intensive agricultural operations is narrow since, the Green Revolution has been evident mainly in the north-western portions of India and portions of Andhra Pradesh and Tamil Nadu in south India.

3.04 India is also endowed with large areas of non-agricultural/non-forest land. These include common grass lands and pastures, lands occupied by inland water regimes and fallow lands. These lands have been the sources of fuelwood and fodder for the large population of people and livestock in India.

Forests

3.05 India has a very diverse forest vegetation ranging from the temperate vegetation in the Himalayas to the moist Evergreen forests in North East, the Western Coast and the Andaman & Nicobar Islands. The forest cover of the country, as per the lastest assessment of the Forest Survey of India is 63.591 m.ha. comprising 19.44 % of India's geographical area. However,

the areas recorded as forests are higher and stand at 75.18 m. ha. The forests of India can be divided into 16 major groups comprising 221 types. tropical deciduous forests form the major percentage of forest cover in India (37% of total forest cover) followed by tropical dry deciduous forest (28.6%). The unique tropical wet evergreen forests comprise only 8% of the total forest cover. Of the total area of 63.91 million ha., dense forests (crown density above 40%) account for only 38.50 m. ha. There is no tree cover over 11.27 m.ha. officially recorded as forest areas, while another 25.4 mha of forests are understocked. About 52.8% of forests do not have adequate regeneration. The per capita forest area has decreased from 0.20 ha. in 1951 to 0.11 ha. in 1981. India's forest wealth as with the case of other natural resources varies both in quantitative and qualitative forms.

3.06 Apart from natural forests, man-made forests are also expanding due to the afforestation programmes initiated by the Government. The land areas afforested increased from 0.52 lakh ha. in the First Five Year Plan to 177.77 lakh ha. in 1970-71. Despite this progress in afforestation, the target of attaining 33 % land area under forest cover as laid down in the National Forest Policy 1988, appears to be a remote goal at the moment. The reasons are the tendency towards the deforestation and diversion of forest land for non-forestry purposes,the rising demands for

fuelwood and fodder , the increasing incidence of illicit felling, and forest fires. According to an estimate, the total fuelwood removal from forest, both authorised, and unauthorised is more than 235 million cu. ms. as against the sustainable level of production of only 48 million cu.m., which is incidentally placed as the annual fuelwood demand in India. Similarly, the incidence of grazing in forests for meeting the fodder needs of the large livestock population in India is another crucial problem. According to the Forest Survey of India, forest area affected by fire range from 33% in West Bengal to 99% in Manipur. Only 14 States have been covered in these estimates.

3.07 On the positive side had the regulatory regime and legal framework for forest conservation in India not been in place, the trend of deforestation would have been more severe by now. With the passage of the Forest Conservation Act, 1980, the annual rate of diversion of forest land for non-forestry purposes has come down to 16000 ha. annually as compared to 0.15 m.ha. in the pre-1980 period. On the other hand the increase in tree cover through development of forest plantations and natural regeneration programmes under wasteland development schemes in the last decade, has increased the green cover roughly at about 1.8 million hectares per annum, a process which needs to be accelerated.

Biodiversity

3.08 India is uniquely rich in all aspects of bio-diversity including ecosystem, species and genetic bio-diversity. For any one country in the world, it has perhaps the largest array of environmental situations by virtue of its tropical location, varied physical features and climatic types. India has the widest variety of biomes, an attribute further enhanced by the meeting of three major biogeographic realms, namely Indo-Malaya (the richest in the world), the Eurasian and the Afro-tropical. India owes its unique biodiversity to this unmatched interspersion of biogeographic and environmental values. It is estimated that over 75,000 species of fauna and 45,000 of flora are found in India.

3.09 According to a recent classification done by the Wildlife Institute of India, the country has 10 biogeographic zones i.e. Trans-Himalayan; Himalayan; Indian Desert, Semi-arid; Western Ghats; Deccan Peninsula; Gangetic Plain; North-east India; Islands; Coasts.

3.10 The trans-himalayan region with its sparse vegetation has the richest wild sheep and goat community in the world. The snow leopard (Panthera uncia) is found here, as is the migratory Blacknecked Crane (Grus nigricollis). The Himalaya, the highest mountain range in the

world, is located at the boundary of many biogeographical regions and is therefore one of the richest areas of India in terms of habitat and species diversity. In the north-west is the desert region with extensive grasslands. The Great Indian Bustard (Ardeotis nigriceps), a highly endangered bird, is found here. Adjoining the desert is the semi-arid region, a transitional zone between the desert and the denser forests of the Western Ghats. Beyond the Ghats is the Deccan plateau, which is also a semi-arid region lying in the rain shadow of the Western Ghats.

3.11 In the north is the Gangetic plain extending up to the Himalayan foothills. North-east India is one of the richest regions of biodiversity in the country. It has several species of orchids, bamboos, ferns and other plants. This region is also one of the early centres of domestication of cultivated plants such as banana, mango, citrus and jute.

3.12 India has two major groups of islands, Lakshadweep in the Arabian Sea, and Andaman and Nicobar Islands in the Bay of Bengal. The Andaman and Nicobar Islands have some of the best-preserved evergreen forests of India. Several species of plants and animals are endemic to these Islands. India has a very long coastline extending over 5,500 kms. Mangrove vegetation is characteristic of the estuarine tracts along the coast which sustain rich biological diversity. The total area of mangroves

in India is approximately 6700 sq. kms. which comprises about 7% of the world's total mangrove area and harbours 59 species of 41 general belonging to different countries. India is also rich in coral reefs. Major reef formations in Indian seas occur at the Gulf of Mannar, Palk Bay, Gulf of Kutch, the Andaman and Nicobar Islands and the Lakshadweep. With the exception of the Lakshadweep reefs which are atolls, others are of the fringing type. Submerged banks with coral growth are also known from the Arabian sea. The threat to mangroves and coral reefs assume the form of biotic pressures such as fishing, landuse changes in surrounding areas and pollution of waters etc.

3.13 Indian wetlands which represent various geographical regions dot the cold arid zones of Ladakh, warm arid zones of Rajasthan, tropical monsoonic Central India, wet north eastern region, wet southern Peninsula and the coastal wetlands. There are around 17 million hectares of wetlands in the country excluding paddy fields. In India the area under natural wetlands is 1450871 ha. and under man-made wetlands is around 2589266 ha. which is increasing every year. According to estimates, only 28% of the area of 93 important wetlands in India is under total protection which amounts to 53 sites out of the 93 sites. This number does not include a vast number of small, scattered aquatic habitats throughout the country. These include city tanks, rural irrigation water bodies, lagoons,

coastline habitats and other sensitive wetland habitats of biodiversity importance. Out of the 85 wetland sites of international importance in the country, 45% are subjected to moderate or high threat.

3.14 The problems faced by Indian wetlands relate to weed infestation, siltation, pressures of agriculture and encroachments of wetlands, chemical and organic pollution and eutrophication besides, conversion of wetlands for industrialisation, urbanisation and habitation.

Species Diversity

3.15 The Zoological Survey of India, the Botanical Survey of India and the Forest Survey of India study and document the plant and animal diversity of the country. Of the estimated 45,000 plant species, about 15,000 species of flowering plants have been described. Estimates of other plant taxa include 5,000 species of algae, 1,600 of lichens, 20,000 of fungi, 2,700 of bryophytes and 600 of pteridophytes. There are about 75,000 species of animals including 50,000 insects, 4,000 molluscs, 2,000 fishes, 140 amphibians, 420 reptiles, 1,200 birds and 340 mammals, and other invertebrates. A very large number of the species described are endemic to India. Among the larger animals 79 species of mammals, 44 of birds, 15 of reptiles, and three of amphibians are threatened. Nearly 1,500 plant species are considered endangered.

3.16 The main strategy for the conservation of species is the protection of viable habitats in representative ecosystems. In addition, specific measures have been taken to prevent poaching and trade in wildlife products. Special steps to check illegal trade in ivory, rhino horns, furs, skins, musk and peacock feathers have also been taken. India is also a signatory to the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).

3.17 Certain species have been identified as needing a concerted and specifically directed protection effort. Projects have been initiated such as Project Tiger, 'Save the Barasingha' campaign, and more recently a project on the Asiatic Elephant. A citrus sanctuary has been set up in Meghalaya. These programmes, though focussed on single species, have a wider impact as they conserve habitats and a variety of other species.

3.18 *Ex situ* conservation is another thrust in conservation efforts. The Indian Botanical Garden in Howrah (West Bengal) is over 200 years old. Other important botanical gardens include those in Bangalore and Lucknow. Whereas zoological parks have been looked upon essentially as centres for education and recreation, they have also played an important role in the conservation of species such as the Manipur Thamin Deer (Cerus eldi eldi) and the Whitewinged Wood Duck (Cairina scutulata). Notable

examples of successful captive breeding are those of Gangetic Gharian (Gavialis gangeticus), turtles and the white tiger.

Genetic Diversity

3.19 A great amount of research needs to be undertaken on the conservation of genetic diversity in India. Sanctuaries and national parks have isolated populations of wild animals thereby decreasing chances of one group breeding with another. Experiments are under way in creating corridors between parks and integrating different parks into larger protected zones in order to broaden the genetic base.

3.20 India has a long tradition of breeding domestic animals for specific qualities. These include cattle, goats, pigs and sheep, as well as horses and pigeons for sport. With the focus on increasing milk yields though cross-breeding, some of the original cattle breeds are in danger of becoming extinct. Efforts for the maintenance of pure breeds of native animals needs to be considerably strengthened. A good deal of attention has been paid to the genetic conservation of domesticated plants. Both *in situ* and *ex situ* conservation methods have been put into practice. However, as in the case of cattle, hybrid varieties of crops are rapidly replacing the land races. Out of an estimated 50,000 varieties of rice in India, the country may be dependent on just 300 in the next decade.

3.21 Numerous locally adapted varieties which performed well under low or no input conditions are being replaced by a few high yielding strains dependent on large quantities of inputs. Such replacement, in large contiguous areas, presents the danger of the spread of serious diseases which can wipe out entire crops.

3.22 *Ex situ* collection and preservation of genetic resources is done through the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, for wild relatives of crop plants, the National Bureau of Animal Genetic Resources at Karnal in Haryana, for domesticated animals, and the National Bureau of Fish Genetic Resources, Lucknow. The NBPGR is the nodal agency for providing germplasm on request to scientific and research insitutions both within and outside India. India is also a signatory to the Global convention for conservation of bio-diversity. There is a need to intensify *in-situ* and *ex-situ* conservation of biodiversity and for codifying ethnoknowledge.

Degraded Lands

3.23 One of the major problems confronting India is the problem of land degradation which has affected 174 m.ha. comprising agricultural, non-agricultural lands and forests. Since the establishment of the National Wastelands Development Board in 1985, it has been possible to ensure

treatment for 40 m.ha of degraded lands in the country affected by water logging (8.53 m.ha.) ravine and gullied lands (3.97 m.ha.) saline and sodic lands (9 m.ha.).

Marine Resources

3.24 The country is rich in marine food resources including fish. It is estimated that the continental shelf alone has an area of 0.44 m.sq.kms. with an estimated production potential of 4.5 m. tonnes of marine produce per year. The present harvest of marine resources from depths up to 40 fathoms is around 1.75 m. tonnes.

Minerals and Energy Resources

3.25 India is rich in both renewable and non-renewable mineral resources and there have been sustained efforts for their discovery and exploration. From an economic point of view iron ore, copper, lead, zinc and gold are the principal minerals. Iron Ore is a major foreign exchange earner for India. also India has gradually evolved as an exporter of aluminium and has achieved near self-sufficiency in zinc. The entire requirement of nickel is presently being imported. There are certain constraints with regard to mineral resources in India - such as low quality copper deposits. The present production of coal in India is 229 million tonnes (1991-92). A target of 308 m.tonnes has been fixed for 1996-97. Indian coal also

suffers from quality problems mainly because of the high ash content of coking coal (22% as against a stipulated 17% for steel plants), oversized coal and presence of extraneous matter in supplies to power plants and inadequate availability of high grade coal for industries.

3.26 In respect of energy sources, hydro carbons have developed a major energy source in recent years. India has about 0.04% of the world's proven resources of hydro carbons. However, the established geological reserves amount to 5.32 billion tonnes only. With the current level of oil production which fell from a peak level of 34.09 million tone in 1990 to 28.46 m. tones in 1992-93, India's efforts for attaining self sufficiency in hydro carbons suffered a set back. Though our natural gas potential was 59.65 billion cu. mt. during the 7th Five Year Plan, actual utilisation was only 40.41 billion cu. mt. due to the balance being flared. It is estimated that the loss to the economy on account of flaring of natural gas is Rupees 1500 crores per year.

Environmental protection and law

Bharat Desai
Jawaharlal Nehru University

ENVIRONMENT PROTECTION AND THE LAW

Dr.Bharat Desai,Asstt.Professor
International Legal Studies Dvn.
School of International Studies
Jawaharlal Nehru University.
NEW DELHI 110 067

I. Constitutional Provisions :

Following the UN Conference on Human Environment(Stockholm,1972), a constitutional amendment (42nd,1976) inserted relevant provisions for environment protection in the Constitution of India in Part IV -Directive Principles- and Part IV A - Fundamental Duties.

(A) Artical 48 A - Directive to the State " to protect and improve the environment and safeguard the forests and wildlife of the country".

(B) Artical 51 (A) (g) - Imposes a fundamental duty on a citizen " to protect and improve the natural environment...".

Fundamental Right- Art.21 - Right to life and liberty.

Legislative Powers- Union List, State List and Concurrent List--Art.246
State List- Entry 6, 14, 17, 18, 21, 24, 25.

Artical 253 ---Empowers the Parliament to enact a law on an item in State List for implementing any treaty, agreement or international decision e.g. Stockholm Conference to which India was a party

II. Legislations :

(A) Water(Prevention & Control of Pollutiom) Act,1974---enabling resolutions passed by State Legislatures under Art.252(1)-Central statute.
(i) seeks to maintain or restore " wholesomeness of water "
(ii) established Central and State Pollution Control Boards (25)
(iii)Restricting Application (Sec.19), Setting Standards (S24), Consent Orders (Sec.25&26), Emergency Measures (Sec.33), Penalties.
--- Amended in 1988, enhancing the penalties.

(B) Water (Prention & Control of Pollution) Cess Act, 1977--- a fiscal statute.
-- collection of a cess on water consumed by person carrying on a "Specified industry" or by local authorities
-- aims to augment resources of Boards.

(C) Air (Prention & Control of Pollution) Act,1981--enacted under Art.253
-- preservation of air quality and control of air pollution
-- existing Pollution Control Boards assigned with additional functior
-- Amended in 1987, enhancing penalties
- citizen suits allowed after giving 60 days statutory notice.

(D) Environment (Protection) Act, 1986-- enacted under Art.253
(i) adopts wide definition of " environment " and its pollutants
(ii) empowers Central Govt. to take measures for " protecting and improving " environmental quality and preventing, controlling and abating environmental pollution.
(iii) in addition to air and water pollution, other possible polluted media covered-- defines hazardous substances
(iv) authorises Central Govt. to constitute an "authority or authorities
(V) came into being on 19 Nov.1986; Rules framed- by virtue of S.6&25.
(Vi) empowers Central Govt. to issue mandatory directions, including summary closure, to any person, officer or any authority(Sec.5)
(vii) Sec.24(2) nullifies deterrent value of EPA
(viii) penalty- Sec.15(1)-- imprisonment for 5 years or fine upto one lakh rupee or both.

References (select) : Basu,D.D., Introduction to the Constitution of India(12th ed)
Desai,B.,Water Pollution in India:Law & Enforcement(1990)
Estimates Committee, Sixty-first Report(1987-88)

*****

FOLLOW-UP WORKSHOP ON THE EARTH SUMMIT

VIGYAN BHAVAN ANNEXE, NEWDELHI, 13-14 NOV. 1992

INTERNATIONAL ENVIRONMENTAL LAW : SOME EMERGING TRENDS

By

Dr.Bharat Desai, Asstt.Professor
International Legal Studies Division
School of International studies
Jawaharlal Nehru University
NEW DELHI 110 067

In the course of human quest to conquer nature, we have unleashed the forces which we are now finding it difficult to control. This is more so both as regards the swiftness and irrevocability of their effect on our fragile planet. The triggering of the global ecological crisis in recent years has raised nagging questions not only as regards 'developmental' paths the mankind has hitherto followed but also its role as the sole arbiter for destinies of all the species on the earth. The scientific warnings are gradually pouring in regarding, among others, poisoning of our air and water, diminishing of bio-diversity, swift depletion of the earth's protective ozone layer and alarming levels of global warming and climate change. The threats to our composite global ecological heritage have never been so real before. Our responses are partly muted, as we often call for ~~for~~ concrete scientific evidences of imminent threats. The need for innovative approches and multilateralism seems urgent today.

In the post-Stockholm(1) period, our attention has been focused upon regulatory mechanisms for national and transnational environmental problems. Environmental Law comprises both 'hard' laws such as national legislations and international treaties as well as 'soft' laws such as standards and regulations. The body of formal international environmental law is growing slowly but steadily. Apart from the process of traditional treaty-making, a vast majority of states already participate in international standard-settting for a variety of subjects, including environmental management.

In fact 'soft law' plays an important role in the evolution of international environmental law. It encompasses some international prescriptions, though lacking requisite characteristics of international legal norms proper, but are capable of producing certain effects. Of course, the 'soft law' travels in tandem with the 'hard law'(2). In fact 'soft law' leaves large amounts of discretion to states, standards are often vague and therefore it is politically convenient(3) to states. It causes an opinion to coalesce and can be a very important catalyst in securing an agreement with a harder edge later.

In the past two decades several international declarations have acted as catalyst in the development of environmental law. Some of them reflect consensus regarding minimum standards for state behaviour in the field of environment. In course of time some of the domestic law principles or even some new norms have sprung up in the process of national or regional efforts to address specific environmental issues. For example, the Helsinki Rules on the Uses of Waters of International Rivers(1966), the Stockholm Declaration on the Human Environment(1972), the World Charter for Nature(1982) the Helsinki Rules on the Protection of the Ozone Layer(1989), the Ministerial Declaration of the Second World Climate Conference(1990) etc. have contributed in consolidating the body of emerging international environmental law.

An interesting feature in the systematic evolution of international environmental law is now discernible. In the past decade or so there is a worldwide concern regarding threats to globally shared resources (a la ozone layer, oceans, antarctica, outer space and atmosphere) and the imperatives of international cooperation to meet the challenge. Accordingly, the process of international law-making on environmental matters is fast becoming more and more centralised(4). It is gradually reducing the scope for individual

states in the standard-setting process. The inherent nature of the process tends to throw up emergence of instant custom(5) too, to suit the requirements of specific environmental issue. For example, the emergence of'precautionary principle'(6) with reference to the climate change issue.

The standard-setting process in the field of international environmental law is relatively faster in view of the urgency involved in resolving specific environmental problems. The emerging regime of legal norms prove to be of great help in fixing responsibility for causing environmental harm. Some international lawyers regard such norms as essentially emanating from the principle of state responsibility. The international eco-standards are regarded de lege lata which are already being practiced. These legal standards provide substantive principles for resolution of international environmental disputes and also for fixing responsibility for environmental injuries. These norms can be deduced prima facie from some of the well known judicial decisions and arbitral awards. The essance of such legal standards is that states are free to exercise their sovereign rights within their territories, but these rights are not unlimited. The International Court of Justice(ICJ) in the Corfu Channel case, dealing with minefield in Albanian territorial waters, found that the mines were laid with "knowledge and connivance" of Albania which did nothing to prevent the disaster(7). Accordingly, the ICJ underscored that every state has the "obligation not to allow knowingly its territory to be used for acts contrary to the rights of other states"(8). In effect, the ICJ reconfirmed the thrust of rationale propounded by the arbitral tribunal in the Trail Smelter case(9), wherein the principle of 'good neighbourliness' was laid down. Judge Manfred Lachs opines that the general rule in this respect is that a state can not use or permit its territory to be used in a way which may cause damage to other states and that any such action or negligence will result in international

responsibility(10).

Coupled with growing centralisation of internaional environmental law, some of the regional organizations(11) are increasingly playing an important role in evolving their own regimes and setting stringent environmental standards. In fact, some of the international environmental regimes leave scope for supplementary regulations at regional or bilateral levels(12). Such regional groupings act as catalysts for seeking protection of their interests as well as in pushing new ideas or norms,while effectively participating in international treaties and protocols. For instance, the precautionary principle and insurance mechanism in the process of drafting a Framework Convention on Climate Change.

It is also important to note the role being played by some of the non-state actors(13), not only in influencing national policies and operational decisions on environmental matters but also in the internaional arena. Some of the international environmental conventions while formally represent agreements among states proper,their basic objective is regulation of rights & obligations among private individuals(14). It thus broadens the net of regulatory regime of international environmental law. Yet the principle of state responsibility remains a prequisite for ensuring its enforcement.

As the nation states are still claiming to retain sovereign powers in international arena and seek to possess'permanent sovereignty over natural resources', enforcement of international treaty obligations poses a big problem. This is true both in respect of developed as well as developing countries. The delemma is more apparent in the case of the developing countries since retainment of their permanent sovereignty over natural resources is regarded as a panacea for removal of poverty and backwardness.

The multilateral treaty-making is a painstaking process. It is especially more so when the contracting parties have adopted an all comprehensive approach in negotiating an agreement. This is quite a time consuming exercise. We have only recently witnessed the marathon process of the Law of the Sea Convention negotiations spanning over a nine year period, which resulted in the "Constitution for the Oceans". The experience of ~~the~~ this convention has brought about the wisdom on the part of the world community in addressing treaty-making in the field of international environmental law. The nature of problems involved in this field require some more special treatment. Accordingly, in view of the requirement for high degree of adaptability of the legal system to rapid and frequent change, the 'framework convention-protocol' approach has been used for evolving a legal regime for the ozone depletion problem(15). As the rationale for this approach goes, the contracting parties just lay down broad policy outlines through the device of a framework convention and leave nettlesome details to be worked out in subsequent protocols. Thus essentially this approach does not seek to incorporate all substantive issues in a single set of negotiations. It not only helps in avoiding to make negotiating process cumbersome and unmanageable but also induces more state parties to enter the framework. Moreover, it provides some breathing space to convince adamant states as well as working out detailed and tougher obligations in subsequent protocols.

Since some of the environmental issues a la ozone depletion, climate change etc. are sui generis - as hard scientific evidence is yet to come by - they require urgent action before it is too late. Therefore a loose legal framework, with in-built law-making process, easy adaptability and possibility of constant review, helps best in dealing with such problems. The Inter-governmental Negotiating Committee(INC) process for the UN Convention on

Climate Change did seek to emulate the example of the ozone regime. It has thrown up a host of legal issues which may be examined by those who are familiar with the traditional modes of treaty-making under international law.

The U.N.Conference on Environment and Development(UNCED), which took place (at Rio de Janeiro in June 1992) two decades after the Stockholm Conference, may prove to be a milestone in the development of international environmental law. The international community has (with overwhelming majority of states participating) agreed upon two Conventions on Climate Change and Biological Diversity, in addition to a non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests. These international instruments also indicate the growing trend of centralisation of law-making process in the field of environment. The merits and demerits of this trend will require close legal scrutiny. The status of the Rio Declaration in standard-setting process also merits attention. The incorporation of several new principles, _a la_ right to development, sustainable development, common but differentiated responsibilities, interdependence and indivisibility of peace, development and environmental protection etc., is aimed at addressing the unique environmental crises being faced by the mankind today.

NOTES

1. The U.N. Conference on the Human Environment (Stockholm, 5-16 June 1972). See UN Doc.A/CONF.48/14/Rev.I.
2. See, generally, "A Hard look at Soft Law", 82 American Soceity of International Law, Proceedings 371 (1988).
3. Geoffrey Palmer, "New ways to make international environmental law", 86 American Journal of International Law 269 (1992). (AJIL)
4. Gunther Handl, " Environmental security and global change: The challenge to international law", 1 Yearbook of International Environmental Law 12 (1990).
5. Bin Cheng, " U.N. resolutions on outer space: Instant international customary law", 5 Indian Journal of International Law 23 (1965).
6. There is a growing catalogue of ministerial declarations and policy statements, which explicitly or implicitly endorse the precautionary principle. For example : Draft Ministerial Declaration, Second World Climate Conference, 13 July 1990; the UN Economic Conference for Europe, Bergen Declaration, Norway, 16 May 1990; UNEP Governing Council , 25 May 1989, Decision 15/27; the Barcelona Convention to combat pollution of the Mediterranean Sea, 3-6 October 1989; Third International Conference on the Protection of the North Sea, Ministerial Declaration, the Hague, 8 March 1990; the IPCC Working Group III, Coastal Zone Management Workshop, Conference Statement, 23 February 1990.
7. ICJ Reports (1949), pp. 16,18,22 and 24.
8. Ibid, p.22.
9. 3 UNRAA 1965 (1949).
10. Manfred Lachs, " Challenge of the Environment ", 39 International and Comparative Law Quarterly 665 (1990).
11. For example, the South Pacific Regional Environment Programme(SPREP) initiatives on climate change and sea level rise in the South Pacific; the South Asian Association for Regional Cooperation(SAARC) initiative for a regional plan of action for protection and preservation of the environment; the Organization for Economic Cooperation and Development(OECD) initiatives relating to 'polluter pays' principle,'equal rights of access' or 'risk communication' etc.
12. See Basel Convention on Control of Transbounrary Movements of Hazardous Wastes and their Disposal 28 International Legal Materials (ILM) 649 (1989). Also see Convention on Early Notification of a Nuclear Accident 25 ILM 1370 (1986).
13. They especially comprise transnational corporations, multilateral lending institutions, non-governmental organizations.
14. See the Paris and Vienna Nuclear Liability Conventions 55 AJIL 1082 (1961) and 9 ILM 45 (1970); the 1969 Brussels Convention on Civil Liability for Oil Pollution Damage 9 ILM 45 (1970) and the 1989 Convention on Civiil Liability for Damage Caused During the Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels (CRTD), UN Doc. ECE/Trans/79.
15. See the Vienna Convention for the Protection of the Ozone Layer 26 ILM 1529 (1987); the Montreal Protocol on Substances that Deplete the Ozone Layer 26 ILM 1550 (1987) and Adjustments to the Montreal Protocol on Substances that Deplete the Ozone Layer 30 ILM 537 (1991).

******

Some Enforcement Issues for Water Pollution Control in India

BHARAT DESAI

Introduction

We have reached a stage in human evolution where our power to ruin and destroy the world around us has come to rival that of the elemental forces of nature.[1] Our power rivals nature's especially where the swiftness and irrevocability of the process is concerned. In fact the scourge of environmental decay stares us in the face today.[2] It can be said to originate in our "ecological misbehaviour".[3]

The problem of environmental pollution is an inevitable byproduct of industrial development. The link between environment and development is inescapable as developmental goals can only be attained through maintaining a certain environmental quality. In view of the rapidly deteriorating environmental conditions, the concept of ecodevelopment has come into vogue in the post-Stockholm period (i.e., in the period since the UN Conference on Human Environment, Stockholm, 1972).[4] This concept lays stress upon ecologically sustainable development.[5]

The author is Assistant Professor, Centre for Studies in Diplomacy, International Law, and Economics, School of International Studies, Jawaharlal Nehru University.

[1] Manfred Lachs, "The Challenge of the Environment", *International and Comparative Law Quarterly* (London), vol. 39, part 3, 1990, p. 663

[2] Mostafa K. Tolba, "Building an Environmental Institutional Framework for the Future", *Environmental Conservation* (Lausanne, Switzerland), vol. 17, no 2, 1990, p. 105

[3] Barbara Ward and René Dubos, *Only One Earth The Care and Maintenance of a Small Planet* (New York, 1972), p. xii.

[4] UN Doc. A/CONF. 48/14/Rev. 1, United Nations Conference on Human Environment, Stockholm, 5–16 June 1972.

[5] According to the World Commission on Environment and Development (WCED) appointed by the General Assembly of the United Nations, sustainable global development requires our adopting a lifestyle within the planet's ecological means. In other words, we have to ensure that the size of population and growth are in harmony with the changing productive potential of the ecosystem. The WCED regards sustainable development as a process of

INTERNATIONAL STUDIES 30, 3 (1993)
Sage Publications New Delhi/Newbury Park/London

This dilemma has turned crucial in the developmental quest of our country. Since its Independence in 1947 India has embarked upon largescale industrialization and urbanization. This has resulted in environmental pollution in general and water pollution in particular. Industries established on the banks of the major rivers have polluted the water of those rivers as chemicals and other kinds of hazardous waste get thrown into those rivers. Lack of proper water treatment or sewage disposal facilities in most towns and cities in India has also greatly contributed to the polluting of those rivers and lakes as untreated sewage is, in most cases, directly thrown into them. The gross pollution of all the fourteen major rivers of India calls for a look at the present state of water pollution in India and the measures taken to combat it. This article seeks to provide a brief overview of the legal framework and the machinery designed to combat water pollution. It highlights the problems of enforcement at the end.

An Overview of the Legal Framework

The Constitution of India is one of the few in the world to provide specifically for the protection of the environment. Since the UN Conference on Human Environment held in 1972, a number of useful provisions have been introduced in Part IV (Directive Principles) and Part IV A (Fundamental Duties) through Constitutional amendments. The protection of the environment has thus been given a Constitutional status rather than a merely legislative one. Although the Directive Principles are not enforceable in a court of law, they do aim at the establishment of economic and social democracy as pledged in the Preamble. A legislation for the protection of the environment may also provide the necessary sanction for the enforcement of the fundamental duties as enshrined in Article 51 (*A*) (*g*), which seeks to protect and improve the natural environment.[6]

In the scheme of distribution of legislative powers, the power to make laws for the protection of the environment is available under all three lists—the Union List, the State List, and the Concurrent List.[7] The

change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with the future as well as present needs. See World Commission on Environment and Development, *Our Common Future* (London: Oxford University Press, 1987), p. 7.

[6] This provision is as follows:

> It shall be the duty of every citizen of India to protect and improve the natural environment, including forests, lakes, rivers, and wild life, and to have compassion for living creatures

[7] Matters relating to water and air pollution are considered under the subjects "Water", "Air", and "Environment". The subject "Water" is listed at Item 17 of the State List in the Seventh Schedule (by virtue of Article 246) of the Constitution of India. The subjects "Air" and "Environment" are not specified in any of the three lists of the Seventh Schedule. They are, therefore, presumed to come under the residuary powers of the Central Government under Item 97 of List I (Union List)

Government of India used to feel handicapped in using the legislative powers for environmental protection available on the State List. (Only the State legislatures could use them.) Recently this was overcome by means of Article 253 in enacting the Environmental Protection Act, 1986. Under this Article Parliament has the power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement, or convention with any other country or countries or any decision made at any international conference, association, or other body. This provision has an overriding effect even if a particular subject falls within the ambit of any of the items on the State List.[8]

The Water (Prevention and Control of Pollution) Act, 1974, is a *locus classicus* in the field.[9] Its aim is to maintain or restore the "wholesomeness of water". Its Statement of Objects and Reasons declares that the problem of pollution of rivers and streams has assumed considerable importance and urgency. It seeks to ensure that the domestic and industrial effluents are not allowed to be discharged into water courses without adequate treatment. The Act is quite comprehensive in its coverage of various types of water. For the purpose of the Act a "stream" includes a river, a water course (whether flowing or for the time being dry), inland water (whether natural or artificial), subterranean waters, and sea or tidal water to the extent specified by notification in the Official Gazette.[10]

As many lacunae were found in the laws relating to environmental protection, Parliament enacted a new Environmental Protection Act (EPA) in 1986 to deal better with some of the problems of coordination, implementation, and enforcement.[11] The EPA, in essence, is an enabling statute which provides for the protection and improvement of the environment. Its Preamble specifically aims at implementing the decisions of the UN Conference on Human Environment held in Stockholm in 1972. It has adopted a very wide definition of the environment and its pollutants.[12] It specifically

[8] In other words, the normal distribution of powers will not stand in the way of Parliament's enacting a legislation for carrying out its international obligations, even though such legislation may be necessary in relation to a State subject.

[9] Act No. 6 of 1974 (hereinafter referred to as the Water Act) received the assent of the President of India on 23 March 1974. It was enacted by Parliament taking recourse to the provision of Article 252 (1) of the Constitution. This article empowers Parliament to enact a law on any item on the State List if the legislatures of two or more States pass resolutions to that effect.

[10] Ibid., Section 2 (*j*).

[11] Act No. 29 of 1986 received the assent of the President of India on 23 May 1986.

[12] Ibid., Section 2. It provides:

(*a*) "Environment" includes water, air, and land and the interrelationship which exists among and between water, air, and land and human beings, other living creatures, plants, micro-organisms, and property;

(*b*) "Environment Pollutant" means any solid, liquid, or gaseous substance present in such concentration as may be, or tend to be, injurious to [the] environment . . . .

gives powers to the Central Government "to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling, and abating environmental pollution".[13] It enumerates a variety of subjects, including quality standards, maximum permissible concentrations of pollutants, and location of industries which the Central Government may regulate for the purpose. It extends Government control beyond air and water pollution so as to include other possible polluted media too. It specifically defines hazardous substances as a regulable category, as distinguished from ordinary pollutants.[14]

The provisions available in some of the old laws—as, for example, the Indian Penal Code (1960), the Criminal Procedure Code (1973), etc.—have also been used for the purpose of prevention and control of water pollution.

The Machinery

The effectiveness of a legal framework is essentially conditioned by the machinery entrusted with the task of enforcement. It should suffice here for us to state briefly the composition of the enforcement machinery for water pollution control in India.

The Department of Environment of the Government of India is the focal point in the administrative structure and policymaking for matters concerning environment.[15] Some of the State Governments also have separate Departments of Environment. However, the actual implementation of the relevant laws is in the hands of the statutory Pollution Control Boards both at the Centre and in the States.[16] These bodies were first set up under the Water (Prevention and Control of Pollution) Act, 1974, to control water pollution. They were later given the task of preventing and controlling air pollution also under the Air (Prevention and Control of Pollution) Act, 1981.

[13] Ibid., Section 3(1).

[14] Section 2 (*e*) runs as follows:

> "Hazardous substance" means any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property or the environment . . . .

[15] The Department of Environment was set up in pursuance of the recommendations made by a high-level committee constituted under the chairmanship of N D. Tiwari in February 1980 to suggest the legislative and administrative measures needed to ensure environmental protection. It came into existence on 1 November 1980. Subsequently, in September 1985, a full-fledged Ministry of Environment and Forests was constituted.

[16] These twenty Pollution Control Boards are in the States of Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal.

The Pollution Control Board at the Centre[17] comprises seventeen members[18] nominated by the Central Government. These include a full-time Chairman, five officers to represent the Central Government, five officers from among the members of the State Pollution Control Boards[19], three nonofficials to represent the interests of agriculture, fisheries, industry, trade or any other interest, and two persons to represent the companies or corporations owned, managed, or controlled by the Central Government. The Central Government also appoints a full-time Member-Secretary who possesses the qualifications, knowledge, and experience of scientific, engineering, or management aspects of pollution control.[20] The Central Board is entrusted with the job of overall monitoring and coordination of the activities of the State Boards. It also acts as the State Board for the Union Territories.[21] The composition of the State Boards is more or less similar to that of the Central Board.[22]

The Environmental Protection Act enacted by Parliament also empowers the Central Government to constitute an authority or authorities for the administration of the Act apart from the Pollution Control Boards.[23] The Department of Environment of the Government of India has framed the Rules under the Act.[24]

However, no such authority or authorities as envisaged in the EPA has been set up so far. Instead the Department of Environment thinks it prudent to delegate powers under the Act to some of its own officials as well as to the present setup of the Pollution Control Boards.[25] This makes it clear why not much headway has been made in the matter of implementation during the period of more than seven years since the Act came into being.

Some Enforcement Issues

An inquiry into the actual implementation of the laws in force also calls for a look at the role of the machinery entrusted with the task. The present setup of the Central and State Pollution Control Boards in India faces

[17] The Board has been renamed by Section 3 (*a*) of the Water (Prevention and Control of Pollution) Amendment Act, 1988 (Act No. 53 of 1988).

[18] See Section 3 of the Water Act.

[19] See Section 4 (*a*) of Act No. 53 of 1988

[20] Section 3(2) (*f*) of the Water Act, as amended in 1988

[21] See Section 4(4) of the Water Act.

[22] The Water Act originally prescribed a full-time Chairman for the State Board. However, by an amendment (Act No. 44 of 1978), the word "full-time" was omitted from Section 4(2) (*a*) of the Water Act, so that the Chairman could now be even "part-time".

[23] See Section 3(3) of Act No. 29 of 1986.

[24] The Environment (Protection) Rules were notified in the *Gazette of India*, vide Notification S.O. No. 844(*E*), dated 19 November 1986. These rules were further amended by S.O. No. 82(*E*), 83(*E*), and 84(*E*) dated 16 February 1987; S.O. No. 393(*E*) and 394(*E*) dated 16 April 1987; and S.O. No. 443(*E*) dated 18 April 1987.

[25] By virtue of Sections 6 and 23 of the Environmental Protection Act.

some problems in the enforcement of the statutes concerned. Their performance is found to be wanting on several counts. It is generally felt that the enforcement of pollution control laws in India has been sporadic and uncertain.[26] An identification of some of the major issues would perhaps help in understanding the state of water pollution control in our country.

(a) Funds

In the interest of effective performance by the enforcement machinery it would be important to ensure the smooth flow of the required funds and their rational use. Provision of the necessary wherewithal for pollution control is a basic concern of the State Boards in India. The availability of funds does not appear to have posed much of a problem to the Central Pollution Control Board. This may be so because of the significance of its role in carrying out the overall monitoring as the National Board and as the State Board for the Union Territories. In fact the Central Board has received generous grants-in-aid from the Government of India. The grant-in-aid reached the figure of Rs 21.2 million in 1987–88—a more than tenfold increase in ten years.[27] The activities of the Central Board by way of monitoring or control of pollution in the Union Territories account for a major part of its expenditure.[28] Of course administrative expenses constitute a major part of the total expenses of the Central Board. (See Table 1.)

The basic source of funds for the State Pollution Control Boards is, as may be supposed, the grants-in-aid they receive from their respective State Governments. As these are uncertain, the financial position of most State Boards is far from comfortable. This has not only hampered their smooth functioning but also put paid to their activities in the field of pollution control. Any sort of financial squeeze, clamped advertently or inadvertently, is bound to have a demoralizing effect on the State Boards in the enforcement of the statutes concerned, especially in the launching of prosecutions against polluters. For example, in the most populous State of Uttar Pradesh the State Board received a grant of barely two million rupees[29] as against its total budget of Rs 20.36 million for the year 1989–90. Not many State Boards can boast of good performance because of substantial grants-in-aid

[26] See Susan G. Hadden, "Statutes and Standards for Pollution Control in India", *Economic and Political Weekly* (Bombay), 18 April 1987, p. 715.

[27] Central Pollution Control Board, *Annual Report, 1987–88* (New Delhi, 1988), p. 57.

[28] As the National Board, the Central Pollution Control Board incurs expenditure on account of inter-State monitoring, basin and sub-basin studies, comprehensive industry documents, air pollution control, etc. As the State Board for the Union Territories, it spends on laboratory facilities, monitoring, and control of pollution at source.

[29] See Uttar Pradesh Pollution Control Board, *Annual Report, 1989–90* (Lucknow, 1990).

Table 1
Grants-in-Aid Given to and Expenditure Incurred by the Central Pollution Control Board
(Rupees in Millions)

Year	*Grants-in aid (amounts released)*	*Expenditure*			
		Activities			*Administration*
		As Central Board	*As State Board*	*Total*	
1987–88	21.20	-	-	15.68*	5.63
1986–87	15.70	-	-	13.15*	3.81
1985–86	12.00	-	-	12.49*	2.90
1984–85	16.50	-	-	9.10*	2.14
1983–84	14.00	7.54	3.05	10.59	4.23
1982–83	8.80	2.80	1.92	4.72	2.82
1981–82	7.00	1.92	1.55	3.47	2.27
1980–81	4.50	2.08	0.79	2.87	1.82
1979–80	3.97	1.11	0.80	1.91	1.84
1978–79	3.70	0.83	1.44	2.27	1.40
1977–78	2.00	0.20	0.88	1.08	0.60

* Breakup not available

Source: See the *Annual Reports* of the Central Pollution Control Board, New Delhi, from 1977–78 to 1987–88. See also the *Sixty-First Report, 1987–88* of the Estimates Committee published by the Lok Sabha Secretariat, New Delhi, 1988.

provided by their State Governments. For example, the Gujarat Pollution Control Board received a grant-in-aid of Rs. 7.3 million during 1983–84.[30] This rose to Rs 13.8 million during 1989–90.[31] In the most industrialized State of Maharashtra, the State Board has a budget of Rs 15 million.[32]

It needs to be noted that the Water Act (1974) is silent on the provision of funds for the Boards although these are supposed to be autonomous.[33] Even the Water Cess Act (1977) is not helpful in this respect.[34] It provides for the levy of a cess on every person carrying on a "specified industry" or on

[30] See Gujarat Pollution Control Board, *Annual Report, 1983–84* (Gandhinagar, 1984), p. 11.

[31] Ibid., *Annual Report, 1989–90* (Gandhinagar, 1990), p. 14.

[32] Data provided by the Chairman of the Maharashtra Pollution Control Board in his discussions with the present author on 1 February 1991 in Bombay.

[33] Section 37(1) of the Water Act merely says as follows in this respect: "The State Board shall have its own fund and the sums which may, from time to time, be paid to it by the State Government and all other receipts [by way of gifts, grants, donations, benefactions (fees), or otherwise] of the Board shall be carried to the fund of the Board and all payment by the Board shall be made therefrom".

There is an identical provision in Section 36(1) of the Act regarding funds for the Central Board.

[34] The Water (Prevention and Control of Pollution) Cess Act (No. 36 of 1977), 1977.

every local authority on the basis of consumption of water.[35] This is, however, rather by way of an incentive to the entrepreneur to install a plant for the treatment of sewage or trade effluents and claim a rebate of 70 per cent.[36] The Cess Act confers the power on the State Boards to assess the cess, to recover it, and to remit the money to the Central Government (to be credited to the Consolidated Fund of India).[37] After deducting the cost of collection the Central Government used to reimburse a part of the money through the respective State Governments. However, seeing that the State Governments are often reluctant to pass on this amount to the State Boards,[38] it seems recently to have decided to avoid this circuitous process and pass on the amount of the cess directly to the State Boards concerned.[39]

Strangely most of the Boards are facing difficulties in the acquisition of the required equipment and laboratory facilities for their monitoring, research, and assessment work. Barring the Central Board, which received Rs 6.41 million during the period of the Sixth Plan, the State Boards did not receive any assistance for laboratory development during that period.[40] The Central Government agreed to provide Rs 15.7 million to sixteen State Boards during the Seventh Plan, as against their demand for Rs 152.7 million.[41] It conceded just a part of the demand for equipment and instruments, and it did not agree to provide assistance in the construction of buildings and for the purchase of vehicles.

(b) Prosecutions

Laws relating to the environment are not being properly implemented in India. To ensure their full implementation is a major problem. Poor

[35] According to Section 2(c) of the Cess Act, Schedule I specifies the following industries as falling within its ambit: (1) The ferrous metallurgical industry; (2) the nonferrous metallurgical industry; (3) the mining industry; (4) the ore-processing industry, (5) the petroleum industry, (6) the petrochemical industry, (7) the chemical industry; (8) the ceramic industry, (9) the cement industry; (10) the textile industry; (11) the paper industry, (12) the fertilizer industry, (13) the coal (including coke) industry, (14) the (thermal and diesel) power-generating industry; and (15) the animal or vegetable products processing industry.

[36] See the Water (Prevention and Control of Pollution) Cess Act (No. 36 of 1977), Section 7.

[37] Ibid., Section 6.

[38] For example, the Bihar State Pollution Control Board, Patna, collected as much as Rs 10.30 million by way of cess during the period from 1979–80 to 1983–84 and remitted Rs 8 27 million to the Government of India However, as against the cess amount of Rs 7 35 million released by the Government of India during the period, the State Government, except for Rs 3 39 million during 1982–83, did not pass on the amount to the State Board

[39] See *Sixty-First Report, 1987–88*, of the Estimates Committee (New Delhi Lok Sabha Secretariat, 1988), p. 24.

[40] Ibid., p. 29.

[41] Ibid., p. 30.

implementation is generally attributed to lack of bureaucratic and political commitment, want of procedures and systems, absence of awareness, and inadequate database and information.[42] The major statutes for the control of water pollution are the Water Act and the Environmental Protection Act. These have not been used in right earnest. In other words the "legal muscle" has not been adequately employed in the matter of ensuring proper enforcement of the Water Act and the Environmental Protection Act.

The consent regime prescribed under the Water Act has not proved effective.[43] The Pollution Control Boards have somehow been "lenient" in passing consent orders which allow industries to discharge effluents, albeit subject to certain conditions. If exercised judiciously, the consent jurisdiction vested in the Boards can be a powerful tool for the prevention and control of water pollution. Although some Boards have put it to effective use, most other Boards have been granting consent in routine fashion. Later they feel helpless about ensuring compliance with the conditions laid down by them in the consent orders.

A study of the prosecutions launched by the Pollution Control Boards under the Water Act would show that the bulk concern violation of the conditions laid down in the consent orders rather than any failure on the part of the industries concerned to obtain consent.[44] This means that a rational use of the power to grant consent can serve as an effective weapon in the enforcement of the Water Act. The main strategy of the Boards is to use persuasion: any industry which fails to comply with the conditions laid down in the consent orders is coaxed and cajoled into complying.[45] It is only when every effort fails that the Board resorts to prosecution. Apparently this "extra-legal" approach—prompted partly by fear of court delays and partly by an anxiety to avoid the forbidding costs of litigation—is responsible for some laxity on the part of the Boards in the exercise of their statutory power. The consent orders are virtually "licences to pollute". The industries generally refuse to be persuaded, pleading some pretext or other.

Both the Central and State Boards have filed a few prosecutions under the Water Act. Functioning in its capacity as the State Board, the Central Board has filed prosecutions in the Union Territories of Delhi, Goa, and Pondicherry. Delhi accounts for the bulk of such prosecutions. Since 1974, when

[42] See G. Sundaram, "Implementation of Environmental Regulations" (a paper presented to the South and Central Asian Cooperation Workshop held at the Administrative Staff College of India, Hyderabad) (Hyderabad, 1986), p. 3.

[43] See Sections 25 and 26 of the Water Act. Under the Water Act the previous consent of the State Board is essential to bring into use any "new or altered outlet" for the discharge of sewage or trade effluent into a stream or well or sewer or on land. The State Board may grant its consent subject to such conditions as it may impose.

[44] See Section 44 of the Water Act.

[45] *Economic Times* (New Delhi), 7 April 1987.

the Central Board came into being, it has launched low-key prosecutions against many defaulting industries. Though the number of prosecutions filed cannot be taken as an indicator of performance, yet it does reflect the Board's will to act. Judged by this criterion, the Central Board does not come out with flying colours. For example, during 1987–88, the Central Board prosecuted nineteen industries under the Water Act.[46] The cases drag on for years in the courts. The Central Board does not pursue them seriously. Even in the few cases that are pursued seriously, the magistrate may at the most direct the defaulting industry to install a treatment plant—a basic requirement normally prescribed in the consent orders.

The scenario as regards the prosecutions launched by the State Boards is even more dismal. The Boards have exercised this power variedly. According to the reports of the Estimates Committee a total of 1,602 cases were filed till 1987–88. Of these, 288 cases were decided; the rest were pending at various stages in courts throughout India.[47] In the last few years some of the State Boards have demonstrated the will to bring polluters to book. They have also used the power delegated to them under the Environmental Protection Act to issue closure notices etc. Following the upward revision of the penalty prescribed under the Water Act in 1988, they have mounted a legal offensive.[48] The Gujarat Board claims to have launched the largest number of prosecutions in India. It analysed 5,439 water samples during 1989–90.[49] This pushed the tally of cases (as on 31 October 1990) under the Water Act to 1,160. The courts disposed of 266 cases; the rest were kept pending.[50] The Gujarat Board also recommended 64 cases to the Central Government for action[51] under the Environmental Protection Act. Of these, six industries were directed to close down. The Uttar Pradesh Board launched cases against 146 industries and two local bodies during 1989–90. Moreover, it recommended 28 cases for action under the Environmental Protection Act.[52]

The above discussion gives us an idea of the use of prosecution as a tool of water pollution control in India. The different Boards have behaved differently at different times, depending on their will at any given moment to prevent pollution. To invoke the punitive provisions of the Water Act, the Boards have to prove that pollution has been caused deliberately, not through negligence. This poses a problem. The problem is aggravated by

[46] See Central Pollution Control Board, *Annual Report, 1987–88*, n 27, pp. 54–55.
[47] See *Sixty-First Report, 1987–88*, of the Estimates Committee, n. 39, pp. 10–11.
[48] Through the Water (Prevention and Control of Pollution) Amendment Act, 1988.
[49] See *Annual Report, 1989–90*, of the Gujarat Pollution Control Board, n. 31, p. 1.
[50] Data provided by the Chief Scientific Officer of the Gujarat Pollution Control Board during his discussions with the present author on 28 January 1991 in Gandhinagar.
[51] For action under Section 5 of the Environmental Protection Act, which empowers the Central Government to issue directions in writing to any person, officer, or authority.
[52] See *Annual Report, 1989–90*, of the Uttar Pradesh Pollution Control Board, n 29, p 3

the fact that the burden of proof lies on the prosecution, not on the industries concerned. Then there are the delays common in court proceedings the defaulters deliberately adopt dilatory tactics. Judicial inertia has also taken a heavy toll. The Supreme Court of India recently suggested the setting up of Environment Courts[33] to speed up disposal of cases. And on 5 August 1992 the Minister for Environment and Forests in the Lok Sabha introduced a legislation called the National Environment Tribunal Bill, 1992 The aim of the proposed legislation is to provide for strict liability for damages arising out of any accident occurring while handling hazardous substances [34] The National Environment Tribunal that is proposed to be set up under this legislation is to deal with cases arising from such accidents and award damages

(c) Penalty

Filing of prosecutions alone will not do. The penal regime of a statute should be severe enough to act as a deterrent. A fine can only act as a "licence to pollute" Ironically, this is precisely what is the matter with the enforcement of the water pollution control law in India.

The Water Act provides for penalties in Chapter VII.[35] Sections 41, 43, 44, and 45 provide for a minimum mandatory sentence. Section 42 prescribes a sentence that may extend to three months or entail a fine or both. Since it gives the option to impose a fine or imprisonment in almost all the cases, the magistrates have imposed a fine in most cases. Even the amount of the fine is generally small. it can amount at the most to ten thousand rupees. As a case gets decided after long delays it is usually profitable for the defaulting industry to pay the fine rather than to set up an effluent treatment plant. Sections 41(1), 43, and 44 provide for a minimum mandatory sentence: it is not to be less than a year and six months. (The maximum sentence is up to six years with fine.) Sections 41(3) and 45 provide for imprisonment for a period not less than two years. (This may

[33] The Supreme Court of India made this observation in *M.C. Mehta* v. *Union of India* (Writ Petition No. 12739 of 1985), 1986 (1) *SCALE* 199, in respect of leakage of oleum gas from one of the units of Sriram Foods and Fertilizer Industries in Delhi on 4 and 6 December 1985

[34] In February 1990 Maneka Gandhi, then Minister of State for Environment, sought to prepare a draft bill for the setting up of Environment Courts in India. The idea was to set up at least one such court with powers of summary trial and the status of a High Court in every State in India. Moreover, there was to be a National Environment Court in New Delhi to entertain appeals from the State Environment Courts The Supreme Court of India was to consider appeals from the National Environment Court only under Article 136 of the Constitution

[35] In view of the anomaly traced in Section 24 (2) of the Environmental Protection Act a commensurate enhancement was made in the penal provision of the Water Act through the Amendment Act of 1988

extend up to seven years with fine.)[56] A new section introduced in 1988 provides a meagre penalty for contravention of certain provisions of the Act.[57] An upward revision in the penal provisions of Chapter VII of the Water Act took place only in 1988. The impact of this revision is yet to be felt. The revision was necessitated by a flaw in a provision in the Environmental Protection Act which had dealt a blow to the much-publicized deterrent value of the new statute.

Although the Environmental Pollution Act lays down imprisonment up to five years or a fine up to one lac (one hundred thousand) rupees,[58] Section 24(2) of the Act undermines the practical value thereof. It reads as follows:

> Where any act or omission constitutes an offence punishable under this Act and also under any other Act, then the offender found guilty of such offence shall be liable *to be punished under the other Act and not under this Act.*[59]

It can be seen that the provision lets off an offender entirely if an act or omission in question falls within the ambit of some other statute too. Therefore, where an act or omission constitutes an offence under both the Water Act and the Environmental Protection Act the meagre penalty prescribed under the Water Act alone applies. This is what led to the halfhearted (and belated) increase in the penalties under Chapter VII of the Water Act in 1988. A commensurate enhancement was also effected in the provisions of the Air Act (1981).[60]

As subsection (*b*) of Section 24 is still on the statute book, no prosecution has so far been filed exclusively under the Environmental Protection Act in a court of law. As things stand at present, the socalled deterrent penalty laid down is of no use as the court will have to consider imposing a penalty in case of water pollution under the Water Act when the impugned action falls within the ambit of both the statutes. The only thing that has saved the Environmental Protection Act from becoming a moribund piece of legislation is the power conferred on the Central Government to issue directions, including the power to direct the closure of any industry, or the prohibition or regulation of any operation or process or stoppage or regulation of the supply of electricity, water, or any other service.[61] In fact this exercise of the executive power circumvents the need to seek a court

[56] As amended by Sections 21, 23, and 24 of the Water Amendment Act, 1988.

[57] See Section 25 of the Water Act

[58] See Section 15 of Act No. 29 of 1986

[59] Emphasis added

[60] The Act was amended through the Air (Prevention and Control of Pollution) Amendment Act (No. 47 of 1987), 1987

[61] See Section 5 of Act No 29 of 1986

order for closure etc. It operates on the basis of a recommendation made for the purpose by any official or Pollution Control Board in whom such power is vested under the Environmental Protection Act. The final decision rests with the Central Government. The State Governments do not yet possess that power.

(d) Coordination

It is imperative that the work of the enforcement machinery should be properly coordinated to attain the desired results. As there are twenty State Pollution Control Boards in India, it is the Central Board, as the National Board, which is required to ensure cohesiveness in the discharge of their statutory obligations.[62] In the Water Act itself the Central Board has been given the explicit mandate to "coordinate the activities of the State Boards and resolve disputes among them".[63] This function is very crucial: not all the State Boards have independent sources of funds (barring the meagre amounts they receive by way of consent fees and the reimbursements made payable to them from the water cess). They are critically dependent upon their respective State Governments, whose attitudes too vary a good deal.

The Central Board provides guidance and assistance to the State Boards in the implementation of various provisions of the relevant statutes as well as in the launching of prosecutions against defaulters. There is also an inbuilt requirement in the Water Act for nomination of persons not exceeding five from among the members of the State Boards to the Central Board, which in a way ensures coordination in their respective roles.[64] The meetings of the Chairmen and the Member-Secretaries of the State Boards organized by the Central Board every quarter are among the important components of coordination in fulfilling their statutory obligations. As an apex policymaking body, some of the important activities of the Central Board include (*a*) preparation of comprehensive documents showing pollution status of the different polluting industries in the States; (*b*) developing minimal national standards for effluents; (*c*) implementation of standards with the help of task forces constituted both at the regional level and at the national level; (*d*) maintenance and working of the National Water Quality Monitoring Stations situated in the States; (*e*) river basin studies; (*f*)

[62] Out of the twentyfive States in India (together with Arunachal Pradesh and Mizoram in 1986 and Goa in 1987) twenty States have so far adopted the Water Act and have constituted their respective State Boards. Moreover, seven Union Territories—the Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Delhi, Lakshadweep, and Pondicherry—are still under the direct charge of the Central Board

[63] See Section 16(2) (*b*) of the Water Act. An identical provision obtains under the Air Act, 1981.

[64] See Section 3 (2) (*c*) of the Water Act.

maintenance and working of the National Air Quality Monitoring Stations situated in the States; and (*g*) compilation of data, preparation of reports, and development of strategies for pollution control and environmental management by the Central Board with the help of the State Boards.[45]

The Central Board thus plays a pivotal role by providing crucial feedback to the State Boards, motivating them, giving policy directions, and determining the overall thrust in the field of prevention and control of water pollution in India.

To ensure smooth coordination, the Central Board has decentralized its activities on a regional basis.[46] This facilitates effective decentralized monitoring and channelization of the entire enforcement machinery. However, there are some obvious problems which are partly due to the present structure of the enforcement machinery. For example, the State Boards are critically dependent upon their respective State Governments for funds, and the attitudes of the State Governments, therefore, largely determine the effectiveness of the State Boards. It is also difficult to ensure uniformity of test results of samples at the laboratories of the Central Board and the State Boards. Even as regards standards, officials of some of the State Boards have, in the course of their discussions with the present author recently, expressed the view that there cannot be uniform standards in a big country like India. Instead they prefer standards evolved on the basis of the "quality of the receiving water". In order to combat the modern problem of water pollution, it is essential to have a network of electronic/computer data storage and retrieval system. The Central Board is now understood to have taken up this task. Such a data storage and retrieval system would constitute an important link in ensuring effective coordination with the State Boards.

Conclusion

In a developing country like India with limited resources, priorities have a vital role to play. Lack of adequate infrastructural facilities poses a problem for the enforcement machinery. To combat water pollution in the country calls for allocation of large funds. Importantly, the present machinery of the Pollution Control Boards must be freed from the vagaries of Governmental funding. Some innovative methods of revenue generation like the issue of environment bonds, public deposits, etc., need to be devised to provide autonomy in a real sense to the Boards. There is no doubt that as

[45] See *Sixty-First Report, 1987–88*, of the Estimates Committee, n. 39, p. 24.

[46] For this purpose the Central Board has periodically opened more zonal offices. It has also made changes in their jurisdiction. At present it has divided the States and the Union Territories into six zones—Southern, Northern, Central, Eastern, Western, and Northeastern

we draw nearer to the closing years of this century, environmentalism will come increasingly into its own. No stone should be left unturned to safeguard the interests of future generations. This places an onerous responsibility on the shoulders of policymakers in India. They will have to ensure that the enforcement machinery performs and delivers.

June 1993

•

Urban environmental issues

A K Maitra
School of Planning and Architecture

unedited version
Research Paper No.3

LAND PLANNING AND MANAGEMENT IN URBAN ENVIRONMENT IN INDIA

A.K. Maitra
Dean of Studies & Head
Department of Environmental Planning
School of Planning & Architecture
New Delhi

The Times Research Foundation
Urban Studies Centre
8, Camac Street, Calcutta 700 017

August 1993

CONTENTS

LAND PLANNING & MANAGEMENT IN URBAN ENVIRONMENT IN INDIA

Abstract

The matrice of settlement developed over thousands of years in India, in various environmental zones, from the urban mosaic which has been overlaid by last 50 years of rapid growth. Between 1961-81, there has been a net increase of land consumption from 4 09% to 6 2% under human habitation over the total geographical area of the country. Being a country of varied topography, climatic zones, and natural endowments, settlements have formed in different areas within the environmental & resource constraints. In order to illustrate the complexities of various types of settlements and their interface with environment, a few cases of different types have been cited, such as, metropolises, new towns, historic towns, towns in ecologically fragile areas etc. Despite the wide geographic variations between the towns, the growing rate of consumption of land under urban uses irrespective of its quality is a common phenomenon.

Urban environmental quality is further degraded by unwholesome development, insanitory habitations, increase of automobile flow through existing narrow urban corridors, dereliction of buildings and areas. The pressure placed on urban land by rapidly rising population have resulted in consumption of good agricultural land in the periphery (Delhi), Wetlands (Bombay & Calcutta), pollution of land due to uncontrolled industrial activity (Hyderabad), all of which are areas of major concern. In addition to these large urban centres, smaller centres who due to their scenic location & other endowments had become popular urban areas are also suffering various degrees of degradation. In some cases, such as Dal Lake at Srinagar, Pushkar at Ajmer, Simla in Himachal Pradesh the very endowments are threatened.

Management in planning of urban land has been based on a three pronged strategy :

(1) encourage rural development, thereby arresting migration thrust to urban areas, a policy which is largely successful considering that in 1991 nearly 75% of people still live in rural areas,

(2) create new Centres of growth through industrialisation, more than 150 such Centres have been established,

(3) plan & manage existing urban areas through control of over land use & development.

Management of existing areas have proved to be difficult, as in the case in all countries, particularly where some urban centres attract disproportionate share of population. The Committee set up by the Government of India to recommend measures to ensure environmental protection acknowledged that Human Settlements constitute the major areas of environmental concern. Scientific techniques of considering all facets of environmental endowments, such as, physiography, hydrology, geology, vegetation, soils etc. are now possible due to extensive information base being built up. The entire country is being mapped to be physical analysis compatible and the new plans for management of urban environment are likely to be distinctly different from the past.

LAND PLANNING AND MANAGEMENT IN URBAN ENVIRONMENT IN INDIA

I. Introduction

Land Supply

1. Land is a basic environmental resource and to accommodate urban population growing at twice the national rate, land is a vital commodity. Land is also a non-renewable resource, and once converted to urban use is generally non-retrievable.

During the last four decades a major part of the demand for land has been met by annexing rural land within urban limits. The National Commission on Urbanisation (NCU) discovered that, unfortunately, *no records are available which show how much land under cultivation has been acquired for or privately converted to urban, non-agricultural use in the last 20 years. Neither the Ministry of Urban Development, nor the State Governments, nor the Survey of India, nor the National Remote Sensing Agency could give this information.*

City by city, it is possible to longitudinally compare the physical spread, but it is not possible to obtain data about how much of this has occurred by conversion of agricultural land, or the quality of the land thus converted[1].

The United Nations Centre for Human Settlement (UNCHS) anticipated that there is likely to be substantial spatial expansion of built up areas of urban settlements in the developing countries varying between 115 to 124 *per cent* over the area covered in 1980 by 2000. It also anticipated a gross density of 120 pp. ha.[2].

At this rate, India would have to convert another 1.25 million hectares under urban settlements by 2001.

Out of India's total geographical area of 329 million hectares, 20.38 million hectares or 6.2 *per cent* (1981) is under human habitation[3]. In 1961, the area under human habitation was 4.09 *per cent* of total. Therefore, within the two decades there has been nearly 50 *per cent* increase in the area under human habitation.

During the same period, population increased by 56 *per cent* (see Table 1 in Appendix). Significantly, the density of population rose by 50 *per cent* as well (146 to 216 pp.km²).

This has been possible through significant reclamation of land from non-productive uses and the gain has been distributed to agriculture, forestry and human habitation. However, records are not available to establish the quality of land that has been lost *vis-a-vis* the land gained.

II. Land and Urban Housing

Migration

2. It is to be noted that the share of population living in urban areas is steadily increasing. The total urban population of 1981 is approximately six times than that of 1901[4].

Quite obviously, substantial rural-urban and intra-urban migration have taken place. *Larger the town/city, greater is the proportion of migrants in it as a general rule, and greater is the diversification of population in terms of ethnic, linguistic, religious composition*[5]. This trend of rural-urban migration has become more pronounced over the decades and majority of the rural migrants who opt for the city are ill equipped to meet the demands of urban economic market, least of all its housing costs.

Majority of these migrants are incapable of finding employment in the formal urban market. Research studies[6] conducted on various metropolises reveal that Bombay has 50-60% employed in the informal sector, Calcutta 25-30%, Delhi 50-60%, Madras 50-70% and Ahmedabad 40-50%. Since the security as well as continuity of employment is not assured in this sector, the people belonging to this economic category also opt for informal housing like squatter settlements, slums and pavement dwellings, contributing to degradation of urban environment.

Housing Condition

3. Also, the rate of housing construction has not been able to keep pace with the population growth. The National Building Organisation had estimated a shortage of 4.6 million housing units in urban areas and 16.1 million units in rural areas in 1980[7]. The same study also estimated that 17.9 *per cent* of the total urban population lived in slums in 1980, and 78.9 *per cent* of the total slum population live in class I cities, while these cities accommodated 60.4 *per cent* of the total urban population. Shortage in the supply of housing has resulted in proliferation of slums, squatter settlements, and pavement dwellers in almost all cities of India.

The quality of available housing stock is also poor. 41.72 *per cent* of urban households live in one room accommodation and 28.08 *per cent* of households live in two roomed accommodation. Due to shortage of even rudimentary shelter provisions, the rate of overcrowding is rising. As it is, the occupancy rate of Indian households is higher than most countries, further increase causes serious health and environmental hazards. The 1971 Census[8] reveals that the average occupancy rate is 4.67 for one room dwelling units, 2.84 for two room dwelling units.

It is worth pointing out that even the poorly constructed, overcrowded, unhygienic shelter is not available to 4.65 million urban population (4.5 *per cent* of total urban population in 1971) and are classified as houseless population. They live on pavements and open areas without any form of shelter.

Planning for Housing

4 On the other hand, the share of funds for public sector housing has been steadily going down from 37% in the 3rd Five Year Plan (1961-66) to 2 36% in the 7th Five Year Plan, while the Plans envisage a high level of investment from private sources.

In order to provide housing to the entire population, additional 50-60 million dwelling units would have to be constructed by the turn of the century. The material requirements for conventional housing would necessitate almost quadrupling the production of the building materials such as bricks, cement, steel, wood, sanitary wares and all these industries consume and degrade land

Land Requirements for Housing

5. Land is an essential component of housing Escalation in the price of land has resulted in loss of option for a home of their own to a vast majority Also, most of the land available adjacent to existing urban areas is either good agricultural land or wetland or undevelopable land.

6. The Central Building Research Institute has been entrusted the task of discovering cheaper material and construction techniques Housing and Urban Development Corporation encourages innovative designs through funding incentives Department of Non-Conventional Energy at all India level and its counterparts at State levels promote use of non-conventional technology for various uses, particularly, at domestic level Recyling of Wastes is becoming popular as an environmental measure.

The thrust of urban development has shifted towards achievement of environmentally satisfactory layouts which provide innovative options to conserve land. Adoption of alternative technology for energy, waste disposal and water supply coupled with low energy consuming transport systems to create affordable habitat for the future, has become the new goal of development planning. Planning profession is beginning to depend on native examples for more reliable direction.

7. The National Commission on Urbanisation recognised that land is a key resource for planned urbanisation, and recommended that *supply of such land should be given topmost priority According to it, possibly the most disastrous feature of the past four decades of urbanisation in India has been our tragic failure to anticipate the rising demand for urban land, and thus be able to ensure an adequate supply at affordable prices*

Systematic method for its delivery to those who need it, by *appropriate interventions to ensure the production of urban land at the right time, place and price* [9], needs to be evolved

III. Urban Heritage

The Continuous Urbanisation Pattern

8 India is one of the few countries in the world which can trace a continuous urbanisation pattern from pre history to modern times From the days of

the Indus Valley Civilisation, followed by Hindu, Islamic, Colonial and contemporary periods, the pattern of urbanisation unfolds a sequence of developments through time and space, some whose origin can be traced back to the *Puranic* times and include towns such as Ayodha, Varanasi, Prayag, Haridwar, Mathura, Vrindavana, Dwarka, etc. Structural continuity can be traced back to nearly five hundred years for more than 150 cities[10].

Significant in all historic cities of India is the level of intensity in the use of land. A comparison of land area covered under urban uses by some of these cities reveal that they were compact in size, urban in character, functional, climatically appropriate, aesthetically pleasing and socially acceptable. The size of the city was limited. For example, Shahjahanabad (Old Delhi) covers only 500 ha, Agra (walled city) 285 ha, Ajmer (historic core) 223 ha, Hyderabad (walled city) 533 ha., Jaipur (pink city) 810 ha, Nagpur (historic core) 344 ha, Bhopal (walled city) 107.8 ha.

A study of morphology shows that apart from a few parks, the cities had very little public open space within its boundaries. For open space recreation, people were expected to go outside the walls, which was seldom more than a kilometer away. However, the courtyard of every house provided private open space.

Fonseca while analysing the courtyard areas of Shahjahanabad observed that 25 *per cent* of the city was covered by these courts, and he called the city an *introverted garden city*. Although many of these cities are located in the hot dry zone of India, they are comparatively cool. The intense development sheltered each building against tropical sun, and vast areas of roofs helped the city to radiate the heat back rapidly at night.

Recent studies done at the School of Planning and Architecture, New Delhi, demonstrate that the courtyards in traditional housing areas are between 5°C-7°C cooler than the adjacent street, whereas the central area of modern Delhi is 5°C warmer than surrounding countryside. These cities can easily accommodate a gross population density of 500 pp.ha., within the environmental paradigms.

Analysis of the land use pattern of historic cores of these metropolises depict the kind of pressure they are subjected to, which is manifest by the very high percentage under commercial use (see Table 2 in Appendix).

9. Majority of the old cities in India are now part of a much larger city. Yet, these have retained their centrality within the urban structure. As a result, the old cities are under pressure for :

(1) change of form due to rising land values,

(2) indiscriminate change of use of buildings, mainly resulting in transformation of residential to industrial and commercial buildings, and

(3) social transformation and change.

The characters of the old cities are changing very rapidly, due to their structural inability to cope with these pressures. The town planning legislation has the power to regulate development of land in accordance with a Development Plan where the historic cities are designated as Conservation Areas.

Conservation

10. Master Plans for cities with historic cores have designated land for commercial centres in the newly planned areas to provide relief and make conservation possible.

Delhi, in its Plan for 2001[11], has designated historic Shahjahanabad as a Special Area, to conserve its heritage and historic fabric. However, the historic core still continues to be the Centre and in order to relieve it from further commercial pressure, a Central Business District, two Sub Central Business Districts, 22 District Centres have been planned, all of which provide enough space for the postulated commercial demand.

Simultaneously, some of the wholesale trades which cause severe environmental problems are proposed to be relocated outside the historic city. Similarly, many of the polluting industries are to be shifted.

Similar action plan has been prepared for the historic city of Hyderabad. It is hoped that by these processes, it would be possible to conserve the heritage of these areas and prevent further degradation.

11. The leassons from historic cities in terms of space organisation and management of urban land are useful. The clear distinction between the urban functions for which land is to be intensively used to reduce consumption and those involving extensive

land uses, outside urban areas, has been lost due to the amorphous growth of urban settlements and in many places the distiction between urban and rural has also been lost.

IV. Evolution of Land Planning

12. Despite the historic heritage in urban land management, confronted with the degrading urban environment, innovative methods were introduced during the colonial period.

The first legislation to improve the urban environment was the City of Bombay Improvement Act 1898, which was followed by similar legislations for the cities of Calcutta, Delhi, Kanpur, Agra, etc. The municipal governments were already entrusted with the task of maintaining basic hygiene infrastructure. The roles of the Improvement Trusts were to initiate, finance and execute city development projects. However, the limitations of municipal boundaries were a constraint for the Improvement Trust activities.

The Madras Town Planning Act, 1915, sought to enlarge the scope by providing for a Planning Department. The process of land assembly through acquisition of land, development of areas, improvement of networks continued till the War years. The Committee on Health Survey and Development (1946) headed by Sir Joseph Bhore made significant recommendations to initiate planned development of settlements, at an all India basis.

Independence of the country resulted in the division of the country, caused migration of millions of refugees from newly created Pakistan, seeking shelter in major urban centres, needing creation of instant cities. Hurriedly resettlement colonies were constructed on surrounding lands, notwithstanding the productivity or ecology considerations. More than a million people were accommodated in these settlements around Calcutta where basic hygiene infrastructure and rudimentary shelter was provided.

In northern India, new towns, such as, Faridabad, Nilokheri, Rajpura were constructed. Refugee resettlement colonies of Malviya Nagar, Kalkaji were constructed in areas which then were rural Delhi. Today, all these areas have either become part of the growing metropolis or rapidly growing towns.

Five Year Plans

13. The Government of India, in the First Five Year Plan for the country (1951-56), recommended that there should be a National Town and Country Planning Act, which would provide for zoning and planned use of land, control of ribbon development, location of industries in areas considered suitable, clearance of slums, carrying out of diagnostic surveys and preparation of Master Plans[13].

Being a subject under the State List of the Indian Constitution, it was upto the States of the Union to legislate for ensuring planned development of land. Over the years, all States have enacted Town and Country Planning Legislation for the areas of their respective jurisdictions.

Successive Five Year Plans have also provided budgetary allocations for preparation of Master Plans for major metropolises (2nd Plan 1956-61), Class I Cities, i.e., cities with 100,000 population or more (3rd Plan 1961-66). During the 4th Plan 1967-74 period, Housing and Urban Development Corporation was established, in 1970, to finance development of housing and urban areas according to Master Plans.

Government of India also permitted international funding agencies to participate in the development of cities, particularly those relating to improvement of the environment.

During the 5th Plan (1974-79) period, a Task Force was appointed to prepare the strategy to develop Small and Medium Towns, i.e., towns below 100,000 population, to contain the growth of larger urban Centres and to distribute urban facilities more evenly. On the basis of the recommendations of this report, the Central Government offered matching grants to State Governments to develop basic infrastructure and undertake environmental improvement programme.

However, it was realised that by controlling development of land alone, it is not possible to ensure environmental quality. Accordingly, during the 6th Plan (1985-90) period a number of legislations were enacted in the field of Environment in order to protect human habitation and urban land.

During the 7th Plan period, a Commission was entrusted with the task of formulating National Urbanisation Policy whose report is being considered by the Government

Development Strategies

14. Upto the Seventh 5th Year Plan, a three pronged strategy was adopted to manage urban land :

(1) encourage programs for rural development, to reduce migration to the urban areas;

(2) create growth centres away from major urban centres, and also provide incentives for growth in backward areas, and

(3) ensure quality of urban environment through effective control over the use of Land.

15. Inherent in the concept of control over the use of land were the factors that:

(1) the land use patterns have direct corelation with the quality of life and that the living environment could be improved by ensuring compatibility among urban land uses, and

(2) it is necessary to obtain state control over land, to ensure its optimal utilisation and that it is possible to establish compatible land use pattern through planning of urban areas.

16. For ensuring planned physical development of urban land, the UK Model of preparing Development Plans was adopted.

In the face of growing population and demand for space, the urban administration set up in India was found to be inadequate, particularly, in cases of those cities requiring expansion of urban areas beyond the municipal limits. Also, the financial situation of majority of the local bodies made them incapable of implementing any Development Plan.

It was necessary to evolve a new organizational set up to manage land development. The way was found through creating Urban Development Authorities which, through suitable legal instruments, could be given the powers to prepare Development Plans, acquire, develop and dispose land according to the Plan, and hand over the developed land and assets to the local government, who by then would be in a position, due to enhanced ratable values, of lands and building to maintain the facilities. The power of the State could be delegated to these Authorities by which any lands, buildings or structures could be acquired for public purposes from individual owners. All metropolises and majority of Class I Cities setup Urban Development Authorities.

17. The Land Acquisition Act of 1894, allowed followed the State Governments to notify the land required for acquisition, but did not necessitate taking over of possession until it was required for development (a 1976 amendment has imposed a time limit).

The Urban Development Authorities, thus, could create land banks, for land to be consumed over the Plan period. Through the development of land, the Development Authorities would recycle the original seed capital and recover the cost of development through disposal of developed lands and buildings. However, only the Delhi Development Authority and few other Authorities were able to assemble land for future development.

18. Apart from ensuring desirable urban development, the government also sought to achieve an equitable distribution of urban infrastructure and other amenities

Experience had shown that private developers left a large section of the economically disadvantaged groups outside the purview of development. One of the major tasks entrusted to these Authorities was to provide urban facilities within the affordability limits of all groups of people. The Urban Development Authorities were to be self-financing but not profit-making. The ability to cross-subsidize various developments by implementing both profit-making and loss-making projects was seen as a major instrument to benefit various disadvantaged economic groups of the society.

The Regional Perspective

19. Study of metropolitan growth revealed that far reaching changes in the spatial structure were taking place in the countryside surrounding the cities, and in order to fulfill the objectives of the Development Plans, it would be necessary to ensure balanced regional development.

For Delhi, an area encompassing settlements beyond the Union Territory boundary was identified as Delhi Metropolitan Area (DMA) An

area encompassing towns as far away as 100 kms. was delineated as the National Capital Region under the National Capital Region Act, 1985.

For Bombay, Prof. Gadgil was appointed by the Maharashtra Government to formulate broad principles of regional planning for the metropolitan regions of Bombay, Panvel and Poona, and to make recommendations for the establishment of Metropolitan Authorities for preparation and execution of such Plans. On the basis of recommendations of the Gadgil Committee, the Maharashtra Regional and Town Planning Act was enacted in 1966 and it came into force in 1967. The Bombay Metropolitan Region was notified in 1967 and a Regional Planning Board was established.

In Calcutta, a team of international experts assembled to prepare the plan discovered that although Calcutta was the focus, more people lived outside Calcutta than inside, but depended on the city for their economic sustainance. The settlement structure extended north-south on both banks of the river over a distance of 80 kms, along a linear form. This linear strip along with adjustments of administrative boundaries was called the Calcutta Metropolitan District and was so notified in 1970.

Metropolitan Development Authorities

20. The Delhi Development Authority (DDA) was created by the Delhi Development Authority Act in 1957, with wide powers to manage all facets of urban development. The City and Industrial Development Corporation (CIDCO), a wholly controlled company, was created in 1970 to plan, design and implement the new city to be known as New Bombay. The Calcutta Metropolitan Development Authority (CMDA) came into being in 1970. All these development authorities were directly responsible to the State Governments who created them and to the local government of the concerned metropolises.

21. Delhi being a Union Territory, created under the State Reorganisation Act of 1956 and administered directly by the Union Government, the absence of local government control did not offer serious constraints on the functioning of DDA. CIDCO was declared as a New Town Development Authority, and due to the divide of the sea between peninsular Bombay and New Bombay, it could work almost independently of Bombay Municipal Corporation.

CMDA on the other hand had to contend with two city corporations, thirtytwo municipalities, and more than four hundred other rural authorities. The State of West Bengal did not enact the Town and Country Planning legislation until 1979. As a result, CMDA could exercise no control over the developments in its areas.

New Towns

22. While management of existing land could be ensured through Development Plans, in order to create alternate foci of growth as well as provide growth incentives to backward areas, the concept of building New Towns as part of industrial infrastructure was adopted.

Establishing new settlements has been the prerogative of emperors. From the Vedic times, Kings have been constructing new towns to commemorate their names for the posterity as well as to control population of existing ones. This was as true in Greece as in India.

23. In India, the new town sites were chosen, the cities were planned and built according to codes made by Sage Manasara called *Shilpasastra* which was enlarged by Raja Bhoja, Kautilya etc. Some of the ancient temple towns such as Madurai, Kanchipuram, still retain ancient structural morphology. They are remarkable for the control over the use of land and compactness of size. Jaipur, built in 1727, is the only modern city to be built on the principles of *Shilpasastra*.

During the Islamic period large number of cities have been built, famous among them are Shahjahanabad, Agra, Lucknow, etc. All these cities also reflect very strict control over the use and consumption of land. For example, the old city of Shahjahanabad covered an area of 500 ha., including the palace, the fort, the large gardens, and accommodated at the height of its glory 200,000 people (during Emperor Aurangzeb's rule), i.e., a density of 400 pp ha. gross.

24. The initial contribution of the colonial rulers towards new settlements were in the form of Cantonments and Civil Lines. The British found the climate of the Indian plains hostile to their well being and therefore tried to evolve climatic solutions in terms of landscape and built form. They rejected the idea of a *house around a courtyard* and buildings jumbled up together without intervening gaps as being unhealthy and too uncomfortable[11]

In keeping with the concept of *house in the country* meant for the nobility in Britain, they also emulated the style in India by developing Cantonment and Civil Line areas at very low densities. For example, the area of Civil Lines in Allahabad is nearly three times larger than the traditional city, yet accommodates one tenth of the population even today.

The very salubrious park like environment created by the British for their own use as well as for the select few Indians they chose to favour consumed large areas of land and created completely different type of urban places. But they were very pleasantly planted, and are more like parks than cities.

25. Railway towns were also new towns, which were built by the Railway Companies operating in India to serve their operational needs. Some of these, such as Jamalpur, Kharagpur, Asansol, in the east; Tundla, Itarsi in the north; Manmad, Veraval in the West; Arkonam, Waltair in the south, have become major towns transcending the original railway function[14]. Although, these were not as opulent in layout, space standards, landscape and amenities as those called Civil Lines, they were also developed at fairly low density, consuming considerable amount of land

Both these types of settlements, however, provided standards of civic amenities such as piped water supply, disposal of waste, street lighting, educational and health facilities way above the adjacent or nearby traditional Indian towns

26. Immediately after independence, the emphasis of the country was to build its own basic industrial manufacturing potential in steel, other metallurgical products, fertilizers etc., and also to generate sufficient electricity to sustain the industrial activity. These basic industries had to be located close to the source of basic raw material, which invariably were in areas away from main urban centres and thus also fulfilled the objectives of the Plan to locate new industries away from large cities to provide necessary growth momentum to backward areas.

Same philosophy applied in the case of harnessing hydro-electric power. In order to accommodate the necessary technical personnel, it was necessary to build attractive settlements with all the necessary social and housing infrastructure.

The models before the planners of early 1950's were the Civil Lines, Cantonments, Railway Towns, which the educated Indian always coveted as being something superior to the traditional congested city. Not surprisingly, the early New Towns were built at very low densities Late Prof. Bijit Ghosh examining the Master Plan of Durgapur commented that *if a man's dream is to possess a cottage, an acre and a cow, and if this is multiplied by 30,000, then the end product is the new town of Durgapur*[15].

A comparative study of land consumption of four first generation Steel Towns is presented in Table below.

Four Steel Towns : Land Take

Name	Original Area Acquired (ha)	Area Acquired for Township and Plant (ha)	Resultant Urban Agglomeration Area	Approximate Population Density (1971) pph at Urban Agglomeration Level
Bhillai	3,200	11,200	12,406	19 76
Bokaro	4,000	13,200	17,893	11 55
Durgapur	2,560	4,352	15,420	38 13
Rourkela	5,120	12,800	12,173	14 17

Source Compiled from data presented in New Towns in India K C Sivaramakrishnan, Indian Institute of Management, Calcutta.

27. Concerned by the colossal land consumption which resulted in loss of livelihood for the acquired villagers and valuable agricultural land, the Government of India set up a committee on Plan Projects which decided to reduce the land take. Further, the Bureau of Public Enterprises which controls financing of public sector townships have increased population densities even further, none of these have paid so much attention to the quality of land consumed, nor on the other attendent developments that take place due to massive investments.

Sivaramakrishnan in his study showed that in each of the Public Sector Steel town, viz., Bhilai, Bokaro, Durgapur, a vast population, who serve the city, but are not employees of the public sector undertaking have built settlements of their own, unauthorisedly and without necessary health infrastructure as is seen below.

Invariably these settlements have come up in environmentally hazardous areas close to the manufacturing plants or in areas which are in the path of polluting effluents.

In the design of all the cities, care was taken to locate the residential areas away from the environmentally hazardous zones, a parameter which is increasingly being flouted by both unauthorized settlements as well as new industries.

In the absence of comprehensive environmental plan for the surrounding land areas, environmental degradation has become inevitable. There are more than 150 New Towns built by industrial undertakings, in both public and private sector, and few are added every year. It is time that certain basic framework for ensuring environmentally safe and sustainable development over time is formulated.

Metropolises

28. For most people, the focus of civilisation centres on large cities and metropolises. Among the vast number of people who inhabit such centres, there are top decision makers, best among doctors, lawyers and other professionals, as well as top spenders. The vast magnitude of their numbers acts as a catalyst for further growth.

Regardless of its suitability to accommodate further growth within the limits of their environments, the cities keep growing. *Despite conditions that are deplorable, the enterprising poor remain attracted by urban environments to which, in most cases, the propertied class have already migrated. Cities are also dumping grounds for surplus people who could not be supported because of draught, flood, insurgency and other stresses in the hinterland*[14]

In early fifties, there were only three metropolises, Calcutta, Bombay and Delhi (in 1991 there are 22). Between 1931-51, the population in Calcutta increased from 2.11 million to 4.59 million (125%). Bombay from 1.22 million to 2.97 million (143%), and Delhi from 0.45 million to 1.44 million (220%).

Slums and Marginal Settlements
in New Towns

Name	Population (1971)	Population in Marginal Settlements (1971)	% of Population Marginal Settlements
Bhilai	245,124	64,685	26.39
Bokaro	107,159	17,565	16.39
Durgapur	206,638	40,004	19.36
Rourkela	172,502	53,363	30.91

Source: New Towns in India, K.C. Sivaramakrishnan, Indian Institute of Management, Calcutta.

All these cities have been expanding continuously over the decades and consumed most of the easily developable land by the 1960's The expansion of urban limits beyond municipal limits posed serious problems of consumption of land which ideally should have been left outside the purview of urbanization. It would be instructive to note how the three major metropolises of the country dealt with the demand on land.

Delhi

29. The Delhi Development Authority inherited a vast urban sprawl consisting of the densely developed old historic city under the control of the Municipal Corporation of Delhi, housing 0.914 million people at a gross density of 533 persons per hectare (ppha), and the colonial development spread over a large area of approximately 16,000 ha of land having 0.466 million people (1951) at a gross density of 29.18 ppha. The framers of Delhi's Development Plan estimated that by 1981, urban area of Delhi would accommodate 4.5 million people against 1.38 million of 1951, while 1.2 million people would be accommodated in the metropolitan region.

Land requirement was based upon the standards of space demand under various land uses. The Plan envisaged a considerably higher density of population for the new areas resulting in increase of area under urban development to the tune of 29,461 ha. attaining, an overall density of 100 ppha This required acquisition of 260 km² of rural land surrounding Delhi, including large number of villages.

Analysis of land in and around Delhi indicated three physical features which constitute the predominant physiography of Delhi; the north-south ridge of the Aravalli Hills, the river Yamuna, the plain triangular land formed by the river and the ridge on one side, and wide stretch of flat alluvial plain on the east of the river. Within this land were 262 villages. The quality of land varied, the land in the southern portion being comparatively poorer than in the north. *The studies recorded that the north-west and north-east portions of Delhi State contain the best agricultural lands of Delhi* [17]. The land along both basins of the river were liable to flooding. The Plan protected the ridge, the flood plains, but could not protect the good agricultural land (see Table 3 in Appendix).

The studies leading to the Second Master Plan for Delhi discovered that the population already resident within the urbanisation limits (Master Plan 1961-81) was 5.45 million against a postulated 4.5 million, and that the development has not been able to consume the entire area of land notified for acquisition. After careful analysis, the study concluded that this area has the capacity to accommodate 8.98 million, although it would be judicious to anticipate 8.2 million by 2001.

The Second Master Plan envisaged a population of 12.17 million in urban Delhi, taking advantage of the fact that the growth of the National Capital Region (NCR) would provide a relief of at least 2 million people. In order to accommodate the 4 million, the Delhi urban area would have to expand by 24,000 hectares

The constraints of land form now really told on the development options. Delhi could not expand further south because of the Aravalli Ranges which Delhi Urban Arts Commission felt should be preserved and developed as a *natural park* [18]. The DDA even thought of reclaiming the entire flood plains of the river, but hydrological studies did not provide safe answers. Naturally, *the land in the south west, and north forming a semi circular arc of the rich alluvial land under intense cultivation* [19] was to be converted to urban land use, of which Dwarka (5,600 ha.) and Narella (10,400 ha.) urban expansion schemes are already under advanced stage of preparation.

Simultaneously, parts of the flood prone land on the basins of the river is being reclaimed through domestic garbage and fly ash dumping, perhaps, at a considerable cost to the ecology of the river. Yet, the Second Master Plan attempts to realise a far higher density of population for the entire urban Delhi at 179 ppha, compared to 100 ppha. of the first Master Plan.

Bombay

30. The Draft Regional Plan recommended the development of a *twin city* across the harbour, on the main land, to the east of peninsular Bombay. This new city or New Bombay as it is called, was to accommodate 2.1 million people.

In 1971, Government notified for acquisition of privately owned land covering 86 villages and measuring 15,594 hectares[20]. In 1973, another 2,870 hectares belonging to 9 villages were added through a separate notification. The 18,464 hectares of notified area represents only 53.72 *per cent*

of the project area, the rest being unsuitable for building.

Analysis showed that out of the project area of 34,370 ha., about 20 *per cent* of the land is low lying and prone to tidal action (see Table 4 in Appendix). The average level of low lying lands is about (+) 1.00 m about msl., while the tidal range varies between (-) 2.41 million to (+) 3.5 million. As a result, saline water intrudes into the area during high tides and recedes during low tides. The land was used for salt resistant paddy cultivation and salt panning. Few minor rivers meandered their way to the creek. Hardly any mangrove was existing.

The question of developing these *wetlands* and the significance of the ecology was not seriously considered. The land features were seen as constraints to development which needed to be overcome by judicious engineering designs. The problems of flooding, poor soil bearing capacity were to be tackled as engineering problems.

The New City Plan instead concentrated on creating an efficient city from the point of view of transportation, social and physical infrastructure, capable of growing as an able counterpart to Bombay. However, the gross population density of 120 ppha. appears to be low considering the difficulties to be encountered for development.

Calcutta

31. The framers of the Calcutta Plan having identified the Calcutta Metropolitan District (CMD) had no specific client. They were to prepare a Plan for the CMD without the necessary statutory power, or an authority to implement the Plan.

Analysis of the land form showed that the best land suitable for development was along both banks of the river which has already been developed. The slope of the land is away from the river. They observed that *within a very short distance from either bank, scarcely more than 2 miles or 3 2 km. any place and much less in most places, the level falls quickly and the low lying lands present great difficulties for urban development on any large scale, being either perennial marshland and swamp or liable to annual inundation during monsoon*[11].

Out of the total geographical area of CMD 1,080 sq km., only 347.4 sq kms, i e. 31 *per cent* of land was under some form of settlement development. The population density of Calcutta was 295 ppha gross, whereas in the rest of CMD, the density was a low 30 ppha. Naturaly, densification of these low density areas offered the option to accommodate growing population.

However, on analysis of various factors, the planners decided to adopt a counter-magnet approach by designating a new city in the northern most part, very much like New Bombay, only with greater distance divide and connected by a continuous linear settlement. This Plan has been implemented piece-meal without any one authority implementing it.

32 The Government of West Bengal, on the other hand, concentrated on reclaiming parts of the salt marshes bordering on the east of Calcutta and developing a city for 0 35 million people. The Calcutta Improvement Trust, progressively developed parts of marshy eastern Calcutta, including a major throughway called Eastern Metropolitan Bye-pass. Unfortunately, neither of these projects really appreciated the ecological damage they might cause to the entire swamp landscape. According to ecologists, Calcutta now is likely to suffer regular floods because of this. Also, this development adversely affects one of the most valuable wetland and biosphere of the Sunderbans delta

In 1976, CMDA prepared a Perspective Plan for CMD, which anticipated a population growth of 4.52 million between 1981-2000. In order to accommodate this population, 20,972 hectares of land is to be annexed from agriculture and developed at a gross density of 215 ppha., while retaining 21 3 *per cent* of the land under agriculture (see Table 5 in Appendix)

Changing Land Use

33. Land within the developed area has been distributed to various land uses according to the particular condition pertaining in any city. On comparison, city by city diversity would become apparent. The increase of land under various land uses would vary but it is difficult to establish meaningful correlation between population growth and land uses, for instance, from 2 36 million (1961) to postulated 4 5 m (1981) in Delhi i e. a growth rate of 88 56% the land designated under residential use increased by 332 *per cent*, commercial by 164 5 *per cent*, industrial by 185 25 *per cent*, resulting in a loss of agricultural land at the rate of 2,081 *per cent* (see Table 3 in Appendix)

On the other hand for a population growth of 40 *per cent* for Calcutta Metropolitan District the land proposed for residential uses increased by 20 *per cent*, whereas for commercial use, increased by 60 *per cent*, public utilities by 107 *per cent* and organised open space by 132 *per cent*

Some Development Authorities like Ahmedabad, Vadodara, Surat, Jamnagar etc. notified very extensive rural areas as being Urban Development Authority area In order to contain growth of the city, they designated growth centres within the Authority's area, eg. Ahemedabad declared four existing towns as growth centres, Vadodara declared ten settlements, only one of which (Padra) was urban, as growth centres to absorb urban population

T profligate nature of these land designations is best illustrated by the case of Bhubaneswar (see Table 6 in Appendix) where, even in 1987, nearly 75 *per cent* of the Authority's area was under non-urban uses

Hyderbad, however, presents the most disastrous example of planned growth The metropolitan area was proposed to cover an area of 9?0.2 sq miles (253,500 ha) with a population of 1,543,238 persons, including seven *tehsils* and over four hundred villages of Hyderabad and Medak districts. The perspective plan drawn up for Hyderabad Metropolitan area by the Town Planning Department visualised development of four satellite towns on the outer fringes of the area — Medachal to the north, Shamsabad to the south, Ghatsekhar to the east and Ramchandrapuram-Patancheruvu to the west[22].

Already, the pollution by uncontrolled industrialisation in Patancheruvu has resulted in the High Court (1991) staying further industrial development in Patancheruvu The Development Plan designations could not control industrial development in sensitive areas, particularly, in the catchment of Hussain Sagar lake. Dramatic changes in the land use of this area has taken place, resulting in high degree of pollution of lake water (see Tables 7 & 8 in Appendix).

Sensitive Locations

34. The generic typology such as Lake Cities, Hill Cities and Coastal cities are discussed here. Historically, large number of settlements have been established through careful management of environmental resources. The limitation of the resources also imposed capacity constraints for expansion. Settlements in these areas were required to observe environmental paradigms strictly However, pressure for growth and expansion have quite often resulted in unacceptable level of environmental hazard and consequently threatening the settlement itself.

Lake Cities

35. Access to potable water source has, traditionally, been one of the most important factors for sustaining any human settlement. Cities, even when founded by all powerful emperors as their capitals, have failed to survive due to lack of dependable supply of adequate quantity of potable water Notable examples are Tughlakabad — fourth city of Delhi -capital of the mighty Tughlakhs and Fatehpur Sikri - capital of the great Mughal Emperor Akbar. In the first case, the water was unfit for consumption and lack of reliable supply was the cause in the second case.

In difficult terrains where ground water is scarce and rivers are few, lakes have been a major source of water. Settlements have emerged in areas where water could be impounded to create a reliable source in the form of a lake, or a lake forms naturally due to topography. Cities such as Udaipur, Bhopal, Secunderabad etc., have been built by creating lakes by impoundment. Pushkar, Nainital, Srinagar are examples of natural lakes around which cities have grown.

All these lakes depend on a watershed from where precipitation flows naturally down towards the reservoir and feeds water to the lakes. The run off water, sometimes, travelling in the form of rivers and rivulets which do not find an exit accumulates at a place to form the lake The storage capacity of any lake, therefore, is dependent on the extent of the catchment area covered by the watershed, the rate of precipitation and the health of the catchment. For example, if the soil of the catchment is polluted, the run off water over such terrain would also pollute the lake which is its reservoir There is an intimate relationship between the development of the region and the lake

The pattern of use of the lake water and its sustenance as a resource is closely related. Due to unconcerned use of lakes, the water is getting increasingly polluted, and a time is not too distant when it may cease to provide any meaningful amenity. For example, ecologists fear that at the current rate of eutrophication, Dal Lake may have

a life of about two decades. Already Anchar lake, which is part of the Dal Lake system has ceased to be a lake. Pollution of the lake at Nainital is causing serious concern. The lakes at Udaipur and Pushkar go dry every few years, and are also being polluted. Evidence of serious environmental deterioration is cause for major concern and invites serious Mitigating actions.

36. The catchment of the *Dal Lake* at Srinagar extends over an area of 316 sq. kilometers, spread over altitude ranges varying between 1,500 metres to 3,700 metres, and soil strata of different types. Much of the catchment in lower altitude zones is covered by *Karewa* soil which is susceptible to erosion.

Agricultural activity varies according to altitude and slope characteristics. Analysis of slopes of the catchment areas reveals that gentle slopes which support agriculture, horticulture and forests constitute approximately 50% of the catchment area and about 30% is almost barren or under permanent snow cover. Thus, deforestation and use of harmful chemicals or over-fertilisation of agricultural land ultimately deposits eroded soil, chemicals and fertilizers, fed, in the main, by Tel Bal Nullah[23], into the Dal Lake.

A phenomenon called *floating gardens* started around 15th Century and progressive reclamation of culuvable land out of Dal Lake started through individual effort.

By this process, nearly 50% of the water of the Dal Lake has been reclaimed over the last century. Today, apart from being a lake of outstanding natural beauty, the Dal Lake is also a habitation of 50,000 people in the floating gardens, who discharge all the wastes into the lake waters

House Boats are boats moored at fixed locations, where families reside over the years. Today, many of them are used as Hotels and serves as tourist attractions. Approximately 700 such boats, supporting nearly 10,000 people are located on the body of the lake. The discharge of waste is made directly into the lake.

The city of Srinagar also has no sewerage treatment plant, but sewage lines from the areas surrounding the Dal Lake discharge untreated sewage into the lake water.

37 The town of *Nainital* has grown around the Lake Nainital which is located in a valley formed in the Shivalik ranges of the lower Himalaya. The valley is narrow and mainly covered by the lake and the city rises up the hills. These hills are also geologically unstable and in 1880, a devastating landslide destroyed the temple and filled up a portion of the lake, now called the Flats[24].

Being a pleasant and cool location, Nainital slowly became a summer resort for the British and more importantly home for number of British style residential public schools. A Mall in the tradition of British Hill Towns in India surrounds the lake, which is used as a promenade and culminates in the Flats with a typically British Bandstand.

The temperate climate in summer makes it a tourist town and in summer the population grows to few times its resident population. Maximum damage to the lake ecology takes place during this period, when the lake is intensively used for recreational purposes. Too many boats are rowed in the lake including oil fired speed boats, causing havoc to the lake fauna and significant spill of oil into the water.

The tourists also add a large amount of biodegradable as well as non-biodegradable garbage, lowering fish population while the level of nutrient rises and adds to the potential for weed growth.

Analysis of lake water reveals presence of various impurities, some of them at a rate higher than permitted by law[25]. The area of Nainital Lake being small (0.5 km^2), even a small amount of pollution is likely to degenerate the water quality

Like Srinagar, Nainital has no sewer treatment plant. However, unlike Srinagar, here only a small proportion of raw sewage is discharged directly into water. Most of the properties are connected to a sewer line running below the Mall

It is absolutely necessary that physically deterministic plan is drawn up for Nainital and its surroundings to arrest the environmental degradation.

38 The *Lake at Pushkar*, on the other hand, is located close to the Rajasthan desert, in the valley between two spurs of Aravalli ranges. The valley stretches between these hills running from North East to South West. This valley is a watershed between the eastern and western drainage systems — the Luni to west and Banas, a tributary of Chambal, to the east. The valley is a typical subtropical tract having very long dry summer, short dry winter and a short rainy season

The town has developed mainly on one side of the lake, along the slope of the land. Due to the very strong religious sentiments towards the lake and its water, Pushkar Lake is protected from pollution. No living being can be killed in this town, so the lake is full of fish. The *ghats* are constructed in such a way that water of the city cannot enter the lake.

The danger to the lake, however, is the ecological degradation that is caused in its catchment. Majority of the hills have above 25 *per cent* slope and are prone to erosion. Slopes covered with vegetation are eroded less, while denuded slopes are prone to wind and rain erosion.

As it is, hills in Rajasthan, which are adjacent to the desert have poor vegetation and wilful destruction causes rapid denudation and this has happened in a major way in the Pushkar catchment. This has resulted in silting up of the lake and occasional flash floods in the town.

In a hot arid climate, depth of water is a protection against evaporation. In recent droughts, the holy lake of Pushkar dried up completely, which may have been caused by the rise of bed level due to deposition of eroded soil.

The denudation of the forest is caused mainly in search of fuelwood and fodder. Pushkar, being a pilgrim centre, attracts a large number of pilgrims every day. In addition, a great fair is held in October and November, when large scale trade in horses, camels and other household animals takes place. Nearly a million pilgrims arrive in the city during this period. The population of the town is only 9,000.

The temporary infrastructure of the city depends largely on biomass, and the surrounding hills provide the ideal resource base. Grazing of cattle further degrades whatever little is left after firewood collection. As a result, serious transformation in the plant species is taking place, i.e. the more salubrious species, such as forests of *Boswellia serrata* are being replaced by grassland.

The degenerated species cannot survive the hot winds, and thus the process of desertification is being encouraged and the lake and its town are seriously threatened[26].

39. *Udaipur*, which derives its name from its founder Rana Udai Singh and the former capital of the princely State of Mewar is known as the *City of Lakes*. Four lakes: Pichhola, Rangsagar, Swaroopnagar, Fatehsagar, set in the backdrop of the Aravali Hills and out of which grow the palaces of Udaipur, presents one of the most spectacular urban water fronts. These lakes had been created by the rulers of the desert State of Rajasthan primarily to maintain water balance and moderate harsh climatic conditions[27].

The Ranas created lakes in this arid zone for multipurpose uses, such as :

(1) to maintain the temperate climatic conditions around royal residences;

(2) to provide strategic protection against invasion,

(3) to supply drinking water to wild animals.

Besides, these lakes at high altitude maintained a ground water balance in the basin. Thus the lake water was never used for drinking purposes, but the aquifers got recharged through percolation process and used to maintain the water level of 40 wells and 10 stepped wells located in various parts of the city which provided potable water.

Impact of this waterbody on the entire ecology of the area was dramatic and even until forty years ago, the hills surrounding the city were covered with thick forests, and the temperature of Udaipur was far more tolerable than its neighbours.

However, the level of pollution of the lake is beginning to cause concern. Limnological studies conducted by Sukhadia University indicate various levels of eutrophication, and further studies are continuing[28]. Evidence indicates that causative factors lie in the use of water by the rapidly growing urban population and the resultant developments.

The natural topography of Udaipur, which is like a saucer, makes it susceptible to pollution as flow of debris, garbage, domestic and industrial waste can easily flow by gravity into the lake.

The physical setting of Pichhola and Fatehsagar Lakes has hills on all the sides rising approximately 20 metres to 150 metres. These slopes accommodate a large number of inhabitants. The toilets, urinals discharge into the drains

which carry dirty water and night soil down the natural slopes to the lakes from all sides.

Evidence of significant denudation of forest is evident, as the same slopes which had thick wood earlier, are quite barren today. This has resulted in rapid erosion of soil and some of the slopes may not be able to receive replantation. Agricultural activity has also contributed in adding pesticides and fertilizers to the lakes.

The use of the water by surrounding development for bathing, washing of clothes and utensils, washing animals, open and direct defecation in water, even washing of automobiles contributes a serious load of both nutrients and toxic material.

In addition, unlike the time of the Rana's, water is drawn out of the lake to supply drinking water to the city, where population is rising at a rapid rate. Already the rate of extraction has reached the rate of recharge and deep tubewells in the bed may disturb the aquifers. During the drought years of 1986, 1987 and 1988, the lake became completely dry.

Udaipur, due to its mineral deposits has been identified as a town with growth potential, where the industries are being permitted. Discharge from these industries go directly to the Ahar river, which feed the Udaisagar lake. Therefore, Udaisagar Lake water is highly polluted, with both organic and inorganic deposits.

40. *The Study of the four lakes reveals that chief agents for environmental degradation are common in all the cases .*

(1) *Denudation of forests, unhealthy agricultural and industrial practices in the catchment watershed of the lake, which calls for careful management of the land in the catchment region*

(2) *Sewer and proper drainage system is necessary to prevent flow of wastes, sewage and other wastes.*

It is to be noted that Urban form of the city is a derivative of the natural ecosystem, and the health of the basic ecosystem is directly related to the survival of the city. A lake city can only remain a city if the lake survives, and for survival of the lake, a regional environmental view of development is necessary. The city and its lake, the lake and its catchment are part of the same chain for survival and a chain is as strong as its weakest link. Today, it is important that no weak link is created in the ecological chain and that is the key to the survival of lake cities.

Hill Cities

41. Mountains in northern India were considered to be the abode of the Gods. Largely inaccessible, covered with impenetrable forests, rugged terrain, birth place of mighty Indian rivers, they were sparsely inhabited. Even the nascent industrialisation in India, did not affect the ecology of these places to any marked extent.

The plains of India, which housed the majority population were, however, found to be too inhospitable a place by the British who started ruling India from the middle of eighteenth century. Thus majority of hill towns in India owe their present urban structure to colonial orgin. These settlements were seen more as summer retreats than permanent settlements, to be used for certain part of the year when the climate in the plains became uncomfortable.

String of hill towns were developed by the British in the Himalays, such as Dalhousie, Simla, Mussouri, Darjeeling etc. Educational institutions, patterned on British Public Schools, found an ideal home in these towns. The style of life represented a leisurely holiday spirit with Bandstands and Malls becoming centres for social activities. The character of architecture, also represented more of European tradition and it was easy to adopt the style because of the climate[9].

The leisurely pace of activities were also instrumental in conserving the environmental quality of the area. The architecture that developed had a strong empathy with surroundings. Buildings maintained a continuity of height, proportion and silhuette. The street facade had a cohesive character, without any building of outstanding character. Buildings of architectural merit stood apart from others and commanded a view.

42. Independence of India had a dramatic impact on the easy going leisurely life, because it ushered in an era of development on an equitable basis.

Analysis of the existing pattern of land and building use, height and condition of structure, slope characteristics, geology and aesthetics of majority of hill towns reveals that the environ

mental degradation has been caused mainly due to uncontrolled pattern of development which has ignored the environmental imperatives

There are substantial number of buildings and spaces which do not receive adequate sun exposure, although located in the most favourable orientation. Accessibility is poor due to steep staircases and ramps. Shops and premises have been allowed in areas, which completely cut off the views and reduce circulation space. Large number of buildings are in poor state of repairs

43 Major areas of concern thus emerge as the following

(1) In order to ensure environmentally sensitive development, revision of building bye laws, particularly, regarding set back and heights is necessary. The requirement of set back depends on the degree of slope and orientation of site. In hill areas, exposure to sun light, at least for part of the day, is essential. Therefore, a guide line for determining set backs to satisfy sun exposure requirement would provide a better law than all-purpose set back regulations. Similarly heights of buildings are determined by not only the sun movement pattern but also by the need of other buildings to be able to enjoy the view of the surrounding valley.

(2) Slope is an inclined plane where the overburden of soil is held in place by frictional resistance. Careful analysis of all natural factors should determine the typology and design of buildings.

(3) Comfort in movement is a priority concern because of the low level of oxygen and difficulty in providing easy grades for movement. Non-polluting mechanical means, such as lifts and ropeways, without marring the aesthetic quality of the areas may be considered wherever feasible, rather than encouraging motor car movement.

(4) In the domestic sector, consumption of energy in hill habitats is about three times that of plains. Methods of generation of energy through non-conventional methods, such as solar water heater, bio-gas, solar cooker, thermal insulation, heat absorbent areas etc. need to be encouraged.

(5) Empathy with existing architectural style in the design of new buildings is essential. Somehow, flat roofed buildings look completely out of place. Respect of the existing system of facade division and proportions can result in harmonious development.

Coastal Cities

44. Some of the oldest civilizations have flourished on coastal locations. Some of the largest and most industrialized metropolises of the world like Los Angeles, Osaka, Tokyo border the sea. Also, over the years, most of such cities have contributed in destroying these rich ecosystems by disposal of waste, reclamation of wetlands, destruction of the beaches and natural habitat of a wide variety of flora and fauna, the impact of which is not limited to the immediate environment. The relevance of the high productivity of these ecosystems in supporting life has been recognised all over the world in recent years.

All over the Indian coast, the government is trying to control development on the beaches[10]. The beach is a fragile ecological phenomenon, which can be damaged very easily. In many places, the human settlements have located buildings immediately abutting the high water mark. Internationally, it is recognised that a distance of 500 metres from the high water mark should be kept outside the purview of construction.

India adopted this standard nearly a decade ago, yet hotels, tourist resorts, even industries have come up within this limit in recent years in flagrant violation. The case of Puri is a good example, which has been affected by tourist boom over the last decade. New hotels, as well as the entire city discharges all the effluent untreated directly into the sea.

45. Cochin combines the estuary to coastal location. The city of Cochin is located along the largest brackish water lagoon on the west coast of India. Various rivers which originate in the western ghats flow into the estuary and reach the sea through this lagoon. This estuary is source of wide variety of fish, providing habitat for some varieties of sea fish, shrimps, prawns etc. and spend part of

their life cycle in the estuary. This tropical estuarine ecosystem with high bilogical productivity has been degraded through the years due to human activities, particularly, the settlements adjacent to it[31].

According to limnological studies conducted in these waters, ecologists observed that the estuarine tract adjacent to Cochin city has undergone change to such an extent that the original estuarine features have completely disappeared.

On the other hand, there are some 32 islands of varying sizes with sparse population dispersed over the Cochin region of the Vembanad estuary. Of the 32 islands, twenty fall within the central city boundary of Cochin. In accessibility, poor quality ground water, and generally low lying nature of land has so far protected these islands from human invasion, but the current population studies indicate that the pressure for development, and hunger for land may not allow them to retain their pristine ecological character in future.

46. In Puri, on the other hand, the ground water pattern is such that sweet water is available close to sea. All shallow tubewells produce sweet water, whereas deep tubewells produce saline water. Between Puri to the estuary of the Devi river, the sweet water table takes a trapizoidal shape, with decreasing depth towards north.

In the colonial period, an area in Puri was cordoned off, to be known as Water Works area, because the engineers had realised that any development on this sweet water aquifer will not only deplete its capacity, it may encourage saline water intrusion. Unfortunate development on this area in recent years has created symptoms of water crisis[32].

47. Konark has been designated as a World Heritage monument, and is being developed as a major tourist attraction. Apparently, there are ambitious plans to build an international airport. The ground water potential of this area is poor and over-exploitation can result in serious saline intrusion.

Major coastal ecological initiative, however, was plantation of deep bands of Casurina all over the sand beaches. This particular move started few years before independence and has been successfully continued. By this process, sand drift has been arrested, and land which was non-productive due to sand drift has been reclaimed. However, these green belts have left the urban sea fronts alone, and Puri does not have a single casurina plantation along its beach front.

48. Understanding the relationship between the sea and the urban area appears to be in its formative years, and as a result the directives of the government appear to be unnecessarily restrictive. Particularly when famous hotels in Goa and Kerala advertise their locational advantage of being on the beach, it is difficult to convince the same hotel chain to accept a more mundane location

Conclusion

49. Following points merit serious consideration :

(1) The dilemma in management of urban environment through control over the use of land is serious The growing urban population needs land, and the land available near at hand is either good quality agricultural land or ecologically sensitive land, none of which should be converted to urban uses

(2) It is necessary that serious attempt is made to identify land in the urban regions which may be put to urban uses due to its physical properties, and re-orient the urban structure accordingly.

(3) Consumption of land i a function of gross population densit, Spatial standards for various urban uses determine to some extent the environmental quality of such facilities Here one notices very wild differences While the planners of Calcutta Metropolitan Development Authority envisage a gross population density of 215 ppha, Delhi is attempting 180 ppha and Bombay a mere 120 ppha Internationally, according to 1980 figures, Paris had a gross density of 252 ppha, Manilà 427 ppha, and Hong Kong 556 ppha

In a country where population growth is likely to continue for few more decades, it would be appropriate to adopt higher densities of population and restrain land consumption under urban land uses

(4) Spatial standard for various urban uses also need to have some kind of scientific basis. For example, wild variations are noticed in the designation of land for residential uses, e.g. for residential uses, New Bombay seeks to achieve 35 *per cent*, Delhi 45 *per cent* and Calcutta 62 *per cent*.

Again, Delhi envisages 24 *per cent* of land under recreational uses, while Bombay designates 10 *per cent*, and Calcutta a mere 0.6 *per cent*.

While it is necessary that each city develops a character of its own, this needs to be done within the constraints of a national resource, which is land.

(5) Land which is a crucial endowment obviously needs greater care in its management. Consumption is a function of design of human settlements. A host of other factors such as energy, other resources are also factors of design. The process of natural selection, and the techniques of designing — with nature need to be given greater attention, rather than arithmatic of number and space.

Resolve of all these diverse but inherently compatible demands may provide the guide for future environment of urban areas.

V. Appraisal of Land Planning

Planning Methodology

50. In the context of rapidly rising urban population, the low economic level, general degradation of urban environment, it is necessary to review the planning methodology for effective land management.

The present system of statutory town planning practice in India i.e. institution of surveys, preparation of development plans and subsequent development control, is largely derived from the British[33].

51. In UK the local self government prepares the plan and implements it. It is based on the following facts of British society which are :

- participation of people is ensured in the planning process.

- local authority is able to recover its expenditure on infrastructure through increase in rateable value.

- organised development organisations in the private sector are willing to take advantage of development potential created by planned infrastructure development.

- there are financial institutions to fund both the organised developer and the individual purchaser.

However, the Indian situation is contextually very different. None of the conditions obtained in UK are present, i.e. :

(1) Local government is both organisationally and financially weak, and many of them are superceded.

(2) Development is carried out by individual enterpreneurs who have very little financial and organisational resources. Also development activity is sporadic and unco-ordinated.

(3) The weaker sections of the community cannot afford to enter into the formal sector of housing, resulting in slums and shanty towns in all urban centres.

(4) Local authorities are unable to generate enough resources through property taxes to undertake developmental work, or even maintain the existing network of infrastructure.

(5) There is little or no involvement of people in planning. It is part of bureaucratic process.

But, on the other hand, the people have tremendous dynamism to solve their problems within the constraints of their resources. Harnessed, this dynamism could result in a new order of settlements.

52. Development plan is seen as an instrument both to attract and guide prospective developers

and through the instrument of development control ensure conformity to the plan.

Control over urban development was conceived as a multipronged strategy. The first in the hierarchy of control was the statutory Master Plan or Development Plan which designated land uses for all land for which the plan was prepared.

The Plan was to be further detailed into zonal plans and local area plans, designating various parcels of land detailed uses, and prescriptions for ground coverage, floor area that could be built upon, setbacks that are to be left between adjoining properties, heights to which buildings could be built.

In addition, each construction had to conform to municipal building specifications relating to construction, hygiene and infrastructure standards. Before the advent of the Master Plans, the municipal bye laws governed the standard of development.

53. Since Delhi was the first major Indian city to be planned under the new system of land development and management, the spatial standards for various urban amenities and infrastructure was codified by the plan makers. The standards adopted for the new areas were found to be too high for old city areas due to paucity of land and consequently the standard for these areas were lowered[14].

Same situation arose in the case of Calcutta which came under the planning process a few years later. Standards adopted for Delhi could not be adopted due to serious shortage of land within built up areas.

As a result, all four major metropolises in India have adopted varying spatial standards for urban community spaces and infrastructure facilities for planned development.

Only the standard for environmental improvement for slum areas appear to be similar, mainly due to funding constraints imposed by the government of India.

54. The Town and Country Planning Organisation also recommended various spatial standards for urban community spaces and density of development, which many State Planning Departments adopted. The standards of space and amenities to be provided for new towns are governed by the standards set by the Bureau of Public Enterprises.

The Indian Standards Institution, while framing the National Building Code, also set down certain public space standards. None of these standards correspond with each other, and wide variations are observed. Comparison of Master Plan consumption of land thus reveals variety of rates of land consumption under same land use category. Although some variation is admissible to cater for local situations, gross variation is an undesirable phenomenon.

55. The Development Plan process appears to have been influenced by the London Plan prepared by Abercrobmbia[15]. The Plan envisaged containment of London, both in terms of population as well as space. In order to contain the physical spread of the city, it was proposed to be circumscribed by a Green Belt, which would remain largely rural.

Delhi Master Plan (1962) attempted almost a similar space structure, both in terms of community space organisation as well as urban structure. The studies by Rae Pahl[16] and on London's Green Belt[17] show that while the belt has remained largely green, it has only helped in leap-frogging of expansion beyond the Green. The Land inside Green Belt has become exclusive preserve of the rich who have built their cottages — a permitted land use to go with agriculture.

Delhi has repeated almost the same experience, where the Green Belt is dotted with farm houses of the rich, and the belt beyond the Green is being rapidly urbanised by private developers and unauthorised settlements. The villages in the Belt have become rapidly urbanised[18].

56 The National Commission on Urbanisation (NCU) while studying the aspect of the three dimensional form of the city examined various options recommended that *municipal regulations should be modified*. There is case for considerable fresh look at the standards, as the Delhi experience shows that the same area could accommodate twice as many without any significant deterioration of the environmental quality.

The NCU further recommended that the *city authorities should not rely on crisis management, but should generate an adequate quantity of urban land by anticipating demand, on a scale commensurate with the growth expected over the next few decades.*

57 The statutory plans, which have been content to designate uses for land within a limited area,

have not been able to serve the demands for urban land, resulting in development of land outside planned areas, or the fragrant violation of designated uses.

Since the region of the city is seldom planned as intensively, or controlled in terms of its land use, rapid changes in character are taking place around all major cities of India.

58. It is now obvious that land as an environmental endowment is least understood and cared for. Systematic study of land, its potential, physiographic and geologic conditions are a prerequisite before decisions for consumption under urban uses can be taken. Particular attention needs to be placed in settlement planning on fragile areas such as hills, sea coast, river fronts etc.

VI. Future Options

Identification of Priority

59. *"Future historians may well decide that the crucial phenomenon of our times is the massive urbanisation that is engulfing the Third World"* (NCU).

The Government of India became concerned enough to appoint for the first time a Commission to examine to and deliberate on the broad range of policy interventions necessary to bring about more humane and efficient urban settlements.

After detailed analysis of the urban scenario, the NCU identified the urban centres which can generate economic momentum (GEMs) and require priority development[39]. In a preliminary list, 600 cities and towns were identified as GEMs. These GEMs were further screened from the point of view of physical location, availability of water, energy and transportation; and a final list of 329 GEMs was prepared.

Based on the configuration of the GEMs, 49 spatial priority urbanisation regions throughout the country were delineated, taking into account the 15 Agro-climatic Regions recently identified by the Planning Commission and the 80 natural regions used by the National Sample Survey Organisation. The National Priority Cities (NPCs), State Priority Cities (SPCs), Spatial Priority Urbanisation Regions (SPURs) and the small towns which serve the rural hinterland constituted the physical strategy for future urban pattern in India.

The NCU recognised land as both a resource and an instrument for plannig city development, but did not concern itself with the quality of land that should form the future urban land banks. Unfortunately, data regarding the quality of land already consumed is difficult to come by. Analysis of land in all metropolitan areas of the country shows that surrounding land is either good agricultural land, or ecologically sensitive land.

Environment Assessment

60. Environmental Impact Assessment (EIA) is a valuable tool that enables one to formulate elimination or mitigation measures against undesirable repercussions on the environment that may arise as a result of contemplated actions. The process of assessment allows evaluation of alternative solutions, and choice of optimal options. Urban EIA techniques are comparatively recent acquisition in the field of land planning, and no one method appears to be satisfactory for all situations.

In order to obtain environmental clearance for any major urban project today, in India, it is obligatory to go through the process of EIA.

Delhi Development Authority and CIDCO (New Bombay), two of the major urban developers in the country insist on an EIA for any proposed urban development within its own area of jurisdiction.

However, since most of the developments now being proposed are based on the overall Plans prepared by the same authorities which did not consider environmental factors seriously, task of assessment is difficult.

61. The NCU recommended that a Settlement Survey of India should be established at national level and a Directorate of Urban Land shall be setup in each State. NCU further recommended that future land requirements, especially for housing the poor, should be anticipated and provided for. Squatting on public land may be regularized where possible, but land required for public and social purposes must be protected and selective relocation of squatters from ecologically sensitive land must be undertaken.

In order to protect ecologically sensitive areas from future urban annexation, it is necessary to rapidly identify these lands and areas.

Geographic Information System (GIS) provides an effective and fast method which is designed for computer application and has been proved to be useful in rapid resolution of environmentally conflicting demand on land. Some of these packages are available in India and limited application has taken place.

62. Although some of the environment data, such as land classification, ground water, forest, geology etc. is available, it is not available at the same scale, or at the same degree of detail. Also, this data is available at different sources. It is necessary to collate the available informations and relate it to the Survey of India base.

On the other hand, Remote Sensing techniques have advanced substantially and can be comparatively easily correlated with Survey of India bases. Satellite imagery and areal photography could be combined successfully to delineate various environmental resources in the possible areas of urban expansion.

Study of Doon Valley shows that it is possible to keep a check on various environmental resources in a city region through regular monitoring by satellite imagery co-related with ground checks[40]. Ideally, of course, it should be a combination of GIS, Satellite imagery, areal photo and surveyed maps to provide the most comprehensive tool for managing land and other physical environmental resources.

Directions for Sustainable Development

63. The basic purpose of Environmental Planning should be viewed as an approach to arrive at strategies to achieve environmentally sustainable development.

The Committee, set up by the Government of India to recommend Legislative Measures and Administrative Machinery for Ensuring Environmental Protection, in its report acknowledged that a *major areas relevant to environmental planning and protection is the whole field of Human Settlement*[41].

While examining the legislative provisions available, the Committee had two hundred existing statutes both at Central and State level examined.

64. The committee observed that many of the existing laws relating to management of environmental resources do not clearly state the social objectives they aim to achieve. In the absence of clear objectives, the implementation of the law through administrative machinery has been ineffective. The Committee further observed that some of the laws in force particularly with regard to land use and management of environmental resources appear at times to be accomplishing mutually defeating social objectives. Also, that the implementing and monitoring machinery of many of these legislations are deficient in the scientific and technical expertise as well as other infrastructural resources required to assess and prevent the possibility of adverse environmental impacts.

65 The metropolitan regions in India are vast areas, perhaps larger than many nation on states of the world. They are likely to face almost all the environmental issues faced by an entire country, to list a few, such as :

(1) forests prevention of its degradation and enhancement of its resources,

(2) protecting wild life, its habitat, natural bio-spheres, etc.

(3) prevention of degradation of soil including erosion,

(4) maintenance and enhancement of food production, without resorting to damaging pesticides,

(5) prevention of air and water pollution and restoraton of riverine qualities,

(6) management of the river basins to prevent floods and ensure adequate supply of drinking and irrigation water,

(7) conserve the ancient heritage and aesthetically important areas etc etc

and at the same time achieve higher rates of industrial production to keep up with the national targets, and achieve a balanced distribution of population and job opportunities to prevent concentration and inequity in wealth formulation.

66. One of the key elements in environmental planning is scientific management of land, the physiographic characteristics, such as, elevations and contours; rivers and river basins, the underground sources, such as, water and minerals, fertility characteristics by soil classification, vegetation

support by analysis of the species regime characteristics, and their concentration, are crucial areas of study

In addition, many countries include identification of areas of natural beauty in the list of land resources.

Since land supports majority of human activities, it is crucial to prepare a matrix of the characteristics of the land against the likely competing demands and prepare a compatibility profile to test their suitability under given conditions. For example, use of fertile soil for brick making can adversely affect agriculture and thereby reduce food production or consumption of grazing land for other forms of development can also affect agriculture.

67. The use of land to a large extent determines the quality of the environment. Therefore, it is necessary that the entire pattern of use of land in the region is recorded, and analysed. Only a small portion of the area is likely to be covered under habitation. But the processes of production required to support such habitations create conditions which result in environmental degradation.

—

The Ministry of Environment has notified 20 crucial industries which need a prior clearance from the Ministry. But there are a host of other small and medium industries, which create serious environmental pollution. This has been amply demonstrated by a study conducted by the School of Planning and Architecture on the National Capital Region[42]. Therefore, industries and developments need to be grouped according to their propensity for pollution and the level of danger.

Careful analysis of climate, physiography, land and water can lead to matrix of choice for locations determination which may be compatible and sustainable

68. The National Environmental Engineering Research Institute (NEERI) provides some data on the level of air pollution in major cities of India But this study is not corelated with land use, industrial typology, transport mode and its concentration etc. As a result the planner is constrained in his decision making ability. Till today, no serious effort has been made to establish a land use activity, pollution corelation.

69. The control of pollution and management of environment at a metropolitan region involves multiple authorities at the moment, each looking after its specific areas such as :

(1) water pollution
(2) air pollution
(3) use of pesticides
(4) forests
(5) fisheries
(6) wild life
(7) monuments etc.

Each of these departments have enabling statutes to enforce conformity to the rule of law. However, this assumes a punitive process to ensure conformity.

The task of Planning is to create an environment where it becomes unnecessary to reduce the whole operation to policing only, i.e. the process of physical allocation of land and activity should be scientific and rational

The objective of environmental planning and management is to be constructive, to be able to guide development which can be sustained, with enhancement of the quality of environment and that of life.

REFERENCES

1 Report of the National Commission on Urbanisation : 1988, Vol II.

2 Land for Human Settlements - UNCHS - HS/OP/83.

3 India - a reference Annual - Ministry of Information and Broadcasting, Government of India.

4. Census of India, 1981, Government of India.

5. Biplab Dasgupta, *Urbanisation and Rural Change*. Economic and Political Weekly, February 1987.

6 Report on Employment and Economy, Calcutta Metropolitan District, Seminar Papers 1982 (Unpublished).

7 Handbook on Housing Statistics, 1987, National Buildings Organization, Government of India

8 Census of India, 1971, Government of India.

9. Report of the National Commission on Urbanisation, Vol .II, Government of India.

10. Cunningham Geography of Ancient India.

11 Delhi 2001, Delhi Development Authority

12 Saini N S Prof. (Late) and others, Evolution of Urban Planning in India, Report of the National Commission on Urbanisation, Government of India.

13. King L.D , *Colonial Architecture of India*

14. Sivaramakrishnan K C., *New Towns in India*, IIM Calcutta (Unpublished).

15. Ghosh Brijit (Late) Prof., *The Master Plan of Durgapur*, Design Vol. V, July 1963.

16. Report of the National Commission on Urbanisation, Vol.II, Government of India.

17. Master Plan for Delhi, 1961-81, Work Studies, Vol.II, Delhi Development Authority.

18. Delhi 2001, Delhi Urban Arts Commission Report (Unpublished).

19. Master Plan for Delhi, 1961-81, Work Studies, Vol. II, Delhi Development Authority.

20 Plan for New Bombay, 1971, City and Industrial Development Corporation Report (Unpublished)

21. Basic Development Plan, Calcutta Metropolitan District, 1966, Government of West Bengal.

22. Bawa V K., *Indian Metropolis : Urbanisation, Planning and Management*, New Delhi, 1987.

23. Safaya Ramesh, Thesis, Institute of Town Planners India, 1989 (Unpublished).

24. Pushpalata, Thesis, Urban Development Frame, Nainital : School of Planning and Architecture, New Delhi, 1979 (Unpublished).

25. Environmental Improvement, Project Report, Nainital, CES, 1982 (Unpublished).

26. Pushkar, A Project Study by Students of Landscape Architecture Report, 1984 (Unpublished).

27. Maitra A.K. Prof., Research Project : A Study of the Environmental Factors of Urban Development around the Lakes and their Catchment, Udaipur; School of Planning and Architecture, New Delhi, 1991 (Unpublished), Ministry of Environment and Forests, Government of India

28. Vyas L. N., Ecology and Conservation of Lakes in and around Udaipur, Report 1986, Sukhadia University (Unpublished).

29. Maitra A.K. Prof., Environment Urbanisation Interface : Hill Cities, Journal of the Indian Institute of Architects, Special Issue, Arcacia, 1990.

30. Environmental Guidelines for Development of Beaches, Ministry of Environment and Forests, Government of India.

31 Nambiar Meena, Thesis · Conservation of Estuarine Ecosystems Thesis, Department of Environmental Planning, School of Planning and Architecture, New Delhi, 1989 (Unpublished)

32. Environmental Plan for Coastal Area : Case Study Puri, Konark Coastal Belt, Student Project report, 1992, Department of Environmental Planning, School of Planning and Architecture, New Delhi.

33. Town and Country Planning Act, 1947, Government of UK

34. Master Plan for Delhi, 1961-81, Delhi Development Authority.

35. Plan for London, 1948.

36. Pahl R.E., Patterns of Urban Life, London, 1970.

37. Osborne F., London's Green Belt, London, 1970.

38. Mishra B.N. Prof., Study of Urban Fringe Villages, Delhi Research Project, School of Planning and Architecture, New Delhi (Unpublished).

39. Report of the National Commission on Urbanisation, Vol. I, Government of India

40. Environmental Plan for Doon Valley : Case Study, Student Project, 1991, Department of Environmental Planning, School of Planning and Architecture, New Delhi (Unpublished)

41. Report of the Committee on Legislative Measures and Administrative Machinery for Ensuring Environmental Protection, Government of India.

42. Saini N.S. and Ansari J., Environmental Impact Assessment and Guidelines for Industries Development in NCR, School of Planning and Architecture, New Delhi (Unpublished)

Appendix

Table 1

Land Use Statistics : India

(Total Geographical Area : 328,726,300 ha)

(per cent)

Sl No.	Land Use	1957-58*	1984-85**	Variation (+) or (-)
1	Net Area Cultivated	43.93	46.2	(+) 2.27
2	Permanent Pastures	4.4	3.9	(-) 0.5
3	Area under Tree, Crops and Groves	1.99	1.1	(-) 0.89
4	Forests	17.62	22.1	(+) 4.48
5	Culturable Wastes	7.22	5.2	(-) 2.02
6	Fallow Lands	8.77	8.2	(-) 0.57
7	Barren	11.51	6.6	(-) 4.91
8	Land under Human Settlement	4.56	6.7	(+) 2.14

Sources . Compiled from India 1961, Government of India publication Fact sheet India I - Land (CSE)

* 1957-58 - Reporting area 89.67% of total area.

** 1984-85 - Reporting area 92.4% of total area.

N B : It is worth noting here that there has been significant reclamation of land from non productive uses and this has been distributed among agriculture, forest and human habitation. While the area of land under human settlements has increased by 31.94%, the population increased by 56.65% between 1961-81.

able 2

Comparative Land Use of Historic Cities

Name	Area (ha.)	Residence	Commercial	Land Use		Parks	Government	Density		1971
				Industrial	Public	Open Spaces	Land	Vacant Land	Road	(ppha.)
Shahjahanbad	500 00 (Residenual Area 300 ha)	173 40 (34 6%)	53 40 (10 7%)	11 7 (2 4%)	74 90 (14 9%)	93 80 (18 7%)	17.5 (2.9%)	2.70 (0.2%)	78.20 (15 6%)	818
Hyderabad	533 19	271.39 (50 90%) + slums 3 44 (0 58%)	16.19 (3 64%)	8 9 (1.5%)	35 62 (6 68%)	9 84 (1 8%)	-	66.55 +15.54 (2 8%+11 5%)	111.70 (20 05%)	394
Bhopal	170 80	104 00 (61%)	20 90 (21 05%)	3 4 (2 01%)	3 40 (2 01%)	15 10 (8 63%)	-	-	24 00 (14 10%)	220

Source Thesis School of Planning and Architecture, New Delhi

Table 3

Broad Land Use Distribution : Delhi
(Master Plan for Delhi 1961-81)

Sl. No.	Existing Land Uses 1961: Existing Land Use Category	Area in Acres	% age of Total	Proposed Land Uses 1981: Proposed Land Use Category	Area in Acres	% age of Total	% age Area Increase Over 1961
*1.	Residential	10,954	28 51	Residential	47.360	42 9	332 35
2	Commercial	969	2 52	Commercial	2 563	2 3	164 50
3	Industrial	2,109	5 49	Industrial	6 018	5 4	185 25
4.	Public, Semi-Public	7,877	20 50	Public, Semi-Public	8,857	8.0	12.44
5.	Streets & Nullahs	7,329	19 07	Roads**	8,564	7.6	16.85
6.	Railways	1,111	2.89	Railways	2.518	2.3	126 64
7.	Agriculture & Vacant	6,412	16 69	Agriculture & Nurseries	294	0 3	(-) 2081
8.	Reservation Uses	1,660	4.32	Government	8,163	7 4	391.7
*9.	Recreation	nil	nil	Recreation	28,152	23 7	-
	Total	**38,421**	**100.00 (99.99)**		**112,487**	**100.00 (99.99)**	**192.77**

N.B. Landuses are not strictly comparable

* Recreational areas included in residential, public and semi public in 1961 landuse.

** Roads - *include only a part of the land, all other roads are part of individual land uses.*

Source : Master Plan for Delhi, 1961-81

Note : It is not possible to compare with the Master Plan for Delhi 2001, because detailed land use break up has not been provided In its place range of percentage categories and the amount of land to be allocated to different land uses such as educational, health, open space has been specified according to pupulation On the whole plan envisaged between 40 45 *per cent* of urban land to be under residential use Percentage of land under recreation varying between 12-15 *per cent* have been retained.

New Bombay Project Details

1.	Total Project Area	343.70 sq km.	(34,370 ha)
2.	Areas to be kept out of the purview of urban development	78 86 sq km.	(7,886 ha)
	(a) Low lying areas unsuitable able for development	34 20 sq.km.	
	(b) Existing MIDC industrial area	28.10	
	(c) Existing area under defence	4 56	
	(d) Committed area for port	12 00	
3.	Proposed special land uses	90 25 sq km.	
	(a) Regional Park	72 25	
	(b) Sewage Farming	9 00	
	(c) Fisheries	9.00	
4.	Net area available for Urban Development	174 59 sq km.	ie. 50 8 *per cent* of the total project area

New Bombay : Proposed Land Use

Sl. No.	Land Use	Area km^2	% age of Total Area
1.	Residential	60.70	34 80
2	Commercial	13 85	7 93
3.	Service Industries & Warehouses	11 66	6 34
4	Public and Semi Public	27 55	15 77
5.	University	4 10	2 35
6.	State Reserve Police	4 10	2 35
7.	Intracity Transport	11 10	6 36
8.	Inter City Transport	24 95	14 29
9.	Parks and Playgrounds	17 12	9 81
	Total	**174.59**	**100 00**

Table 5

Calcutta Metropolitan District : Land Use Perspective Plan 1981-2001

Sl No.	Land Use Category	Existing Area in Acres 1981	% age of Total Area	Proposed Area in Acres 2001	% age of Total Area	Proposed Increase in Area between 1981-2001 (%)
1	Residential	155,251.5	48.19	187,251.5	58.12	(+) 20.61
2	Commercial	2,337.82	0.73	3,737.82	1.16	(+) 59.88
3	Industrial	15,367.08	4.77	20,367.08	6.32	(+) 32.54
4.	Public Utilities	2,976.14	0.92	6,176.14	1.92	(+) 107.52
5	Institutional	3,244.54	0.01	6,444.54	2.00	(+) 92.63
6.	Government	1,063.54	0.33	1,863.54	0.58	(+) 75.22
7.	Organised Open Space	2,420.15	0.75	5,620.15	1.75	(+) 132.22
8.	Defense	2,162.86	0.67	2,162.86	0.67	(+) Nil
9.	Transportation	20,664.76	6.41	24,294.76	7.54	(+) 17.57
10	Agriculture	116,671.23	36.22	64,241.23	19.94	(-) 81.61
	Total	**322,159.62**	**100.00**	**322,159.62**	**100.00**	

Table 6

Land Use Changes* : Bhubaneswar : 1930-1987
Urban Development Authority Area

Sl. No.	Land Use Category	Area in 1930 ha.	% age of Total Area	Area in 1978 ha.	% age of Total Area	Area in 1987 ha.	% age of Total Area	% age Increase in Area between 1978-1987	
1.	Residential	-	-	1346.31	5.59	2415.37	9.67	(+)	79.41
2.	Commercial	576	2.31	127.38	0.51	136.63	0.55	(+)	7.26
3.	Industrial	-	-	402.15	1.61	418.88	1.68	(+)	4.16
4.	Administrative	-	-	134.88	0.54	216.81	0.87	(+)	60.74
5.	Institutional & Utilities	101	0.41	521.05	2.05	741.85	2.97	(+)	44.88
6.	Passes & Open Spaces	-	-	794.30	3.18	753.07	3.01	(-)	5.47
7.	River, Canal & other Water Bodies	835	3.34	603.72	2.42	603.72	2.42		Nil
8.	Roads, Railway & Airport	-	-	1121.52	4.49	1121.52	4.49		Nil
9.	Agriculture	9959	39.87	7393.49	29.60	6509.27	26.05	( )	13.58
10.	Vacant Land Including Hill & Jungles	13507	54.07	12542.20	50.21	12060.88	48.29	( )	3.99
	Total	24978	100.00	24978.00	100.00	24978.00	100.00		

* Extrapolation of data has been done by Shri Srikanta Panigrahi Thesis 1992, Department of Environmental Planning, School of Planning & Architecture, New Delhi on the basis of satellite imagery with the help of ORSAC, Bhubaneswar for 1930 land use Data for 1978 and 1987 is based on data given by Directorate of Town Planning, Orissa

Table 7

Population Growth : Hyderabad 1951-81

Year	Municipal Corporation Area Population in million	Urban Development* Authority Area Population in million	Municipal Corporation Area in sq. km.	Urban Development* Authority Area in sq. km.
1951	112.6	112 8	62.94	-
1961	114.8	124 9	62.94	72 2
1971	160.7	179.6	65.35	95 3
1981	218.7	254.6	65.37	102 5

Source : Census Handbook, Hyderabad District, 1961, 1971, 1981, extrapolated Ravi Kiran

* Urban Development Authority -- Area and population extrapolated for comparison by Shri Ravi Kiran, thesis -- Department of Environmental Planning, School of Planning & Architecture, New Delhi

Table 8

Land Use Changes : Catchment Area of Hussain Sagar Hyderabad : 1972-1988

Sl No.	Broad Land Use Category	Area in sq km. 1972	% age of Area	Area in sq. km. 1988	% age of Area	% age of Change in Area between 1972-1988
1.	Built up Area	50 81	17.24	106.49	36.20	(+) 96.75
2.	Cultivated Area	29.87	10.13	21.23	7.22	(-) 40.70
3.	Fairly Dense Scrub	50 60	17.17	29.75	10.12	(-) 70 08
4.	Sparse Scrub	144.37	48.96	117.96	40.11	(-) 22.39
5.	Water Bodies	12 75	4.32	12.75	4.34	(+) Nil
6.	Vineyards	0.75	0.25	0.22	0.07	(-) 240.9
7.	Boulder	5.70	1.93	5.70	1.94	(+) Nil
	Total	**294.85**	**100.00**	**294.10**	**100.00**	

Source : Ravi Kiran - Thesis, Department of Environmental Planning, School of Planning & Architecture, New Delhi

Tools for management of environment

K P Nyati
Confederation of Indian Industry

Confederation of Indian Industry
India Habitat Centre
4th Floor, Zone IV, Lodi Road
New Delhi 110 003
Phones : 4691151 / 4602523, Fax : 4602524
Gram: BUILDPOWER Telex. 031-74014
email:indus%cii@sirneld ernet in

CLEANER INDUSTRIAL PRODUCTION IN DEVELOPING COUNTRIES - PROSPECTS, BARRIERS & STRATEGIES

BY :- K.P.NYATI *

1. INTRODUCTION

1.1 All industrial processes generate waste. Indeed, no production system can ever transform all the input resources completely into end-products. As long as laws of thermodynamics hold, inevitability of waste generation shall remain. The problem is the pollution these wastes create, when discharged in excess of receiving environment's absorptive and assimilative capacity.

1.2 Since, industry has not yet reached the ultimate limits of resource-use efficiency, reducing generation of wastes should have been high on industry's agenda. Not only because of concern for environment but for more fundamental reason of improving profitability. After all what-ever that industry discharges as wastes, are essentially the very resources it buys and pays for in the first place. Nothing comes free. And yet in the past, waste reduction never received the priority it deserved. It is important therefore to reflect and analyse - why?

* Head (Environment Management Division)
Confederation of Indian Industry
India Habitat Centre, 4th Floor, Zone IV
Lodi Road
New Delhi - 110003 (India)

1.3 In the meantime, the realisation that it is the discharge or disposal of wastes, which causes pollution of air, water, soil, etc., led to regulatory interventions, generally in the form of media specific Pollution Control Laws rather than holistic umbrella Acts. The sole objective has been to impose both qualitative and quantitative restrictions on waste generators to limit their discharges within the perceived assimilative capacity of the environment. Accordingly, various types of emission, effluent and disposal standards were set for industry.

1.4 Since, such standards had the legal force and penal provisions, waste generators tended to seek "quick-fix" solutions - a kind of response that aimed only at compliance. As it is, there existed an apparent lack of economic motivation for waste reduction or cleaner industrial production (CIP), the ' command and control ' regime further weaned the industry away from CIP to post - facto " retrofits " or " add-on" pollution control systems.

1.5 Though the environment policy regime did evolve over time, it continued to suffer from media specificities, promoting almost exclusively cross-media transfer instead of curbing generation of pollutants.

1.6 As a result, ever increasing quantity of solid wastes and their disposal is slowly but surely acquiring monumental dimensions. With growing population, energy generation, industrial production etc., disposal of solid wastes is

putting a tremendous pressure on land and its use-pattern. This is where we find ourselves today. Trying to manage somehow what need not have been. Unable to find a solution that can be sustained in future.

2. GENERATION OF WASTE

2.1 Waste generation is a function of technology and the effectiveness with which the technology employed is managed. In developing countries, as it is relatively dirty technologies are employed, specially in small and medium enterprises (SMEs), they are, if at all, rarely operated at levels of efficiency for which they are designed. As such waste generation intensities in terms of quantum of wastes per unit of product output are much higher than what ought to be or what is obtained in developed economies.

2.2 Wastes get generated not only in manufacturing processes but also from the pollution control facilities. The data given in Table-I indicate the (total)solid waste generation intensities in a few selected industrial sectors in India.

TABLE - I

TOTAL SOLID WASTE GENERATION INTENSITIES

	Sector	Solid Waste in tonnes per tonne of product
1.	CHLOR - ALKALI	0.03
2.	DRUGS & PHARMA	4.00
3.	DYES AND PIGMENTS	1.36
4.	ENGINEERING	1.26
5.	NITRO - FERTILIZERS	0.007
6.	INORGANIC CHEMICALS	0.40
7.	ORGANIC CHEMICALS	0.15
8.	PESTICIDES	0.07

2.3 It should not be construed that the sectors covered in Table - I represent the most waste intensive ones. Infact, there are coal fired power plants, iron and steel, aluminium and phosphatic fertilizer industry which constitute the largest solid waste producing sectors in India generating huge quantities of fly ash, blast furnace slag, red mud and phospho - gypsum respectively. For instance fly ash generation alone is of the order of 45 million tonnes annually at present. It is expected to double in next 10 years.

2.4 The key issue is that the quantum of waste generation is increasing rapidly . Not only due to higher intensities but also because industrial base is expanding. It is reflected in the rate at which smaller enterprises numbering over 3 million today are multiplying. If in France, 1% increase in economic growth means 2% extra wastes and that generation of hazardous wastes in U.S.A. is growing at an annual rate of 7%, the growth both in quantity and complexity of waste generation in a developing economy like India is unlikely to be any different.

2.5 Given the thrust on export led growth and greater integration with global economy, most developing nations are likely to increase the share of processed and unprocessed natural resources in their exports (Figure - I). Besides environmental consequences of these extractive activities, the waste generation also is bound to take upward turn.

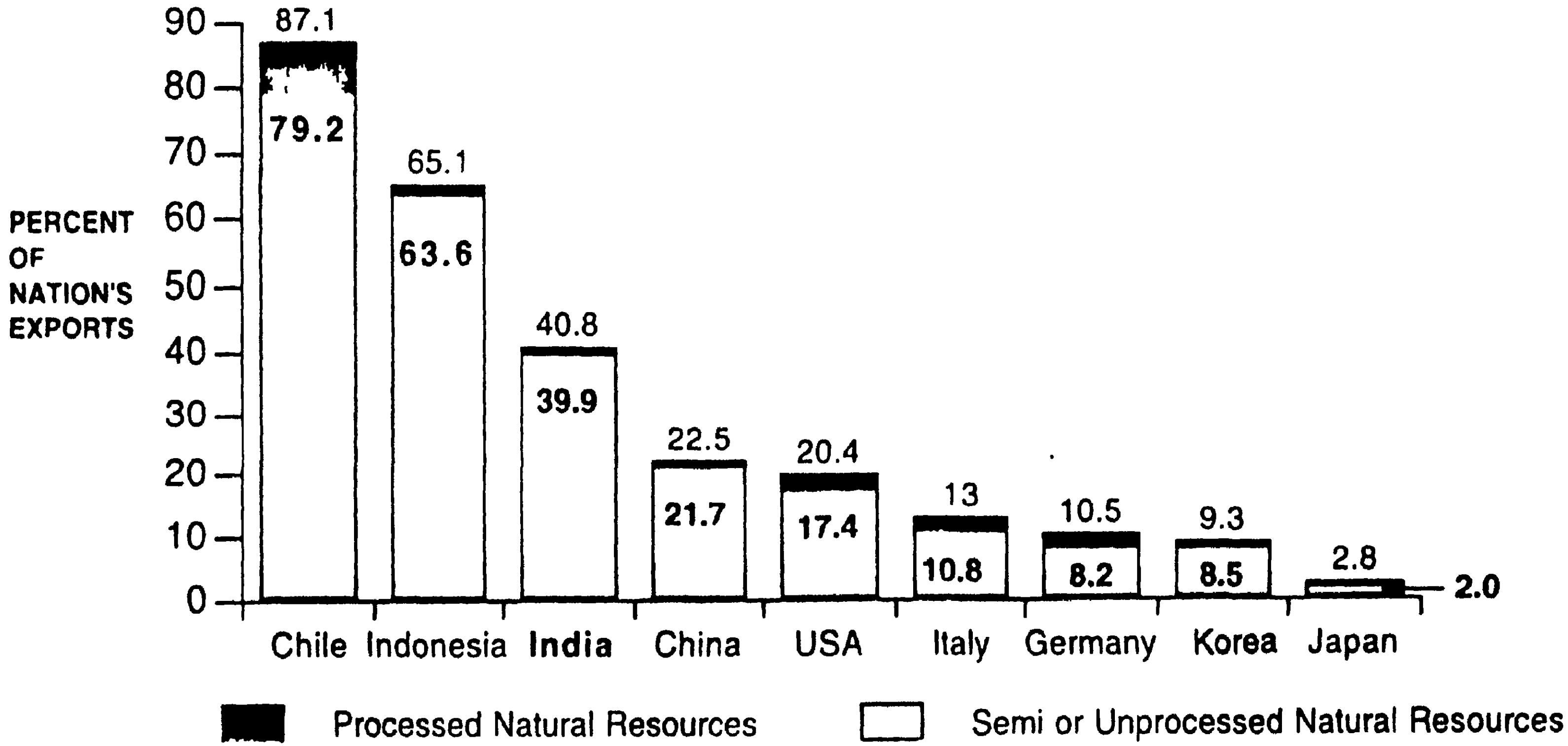
3. WASTE MINIMISATION - THE PROSPECTS

3.1 The potential for waste minimisation and of inducing cleaner industrial culture in developing nations is both enormous and desirable. Studies carried out by Confederation of Indian Industry, National Productivity Council, Indian Institute of Technology, Bombay; National Environmental Engineering Research Institute etc. indicate that nearly 20% reduction in waste generation is possible through simple house-keeping measures requiring no or marginal investments. Projects such as DESIRE launched by UNIDO have testified that such results can be obtained in almost all the industrial sectors. What is more satisfying is the fact that waste minimisation does bring economic as well as environmental benefits simultaneously . This is the finding of above referred studies and the experience of " Waste Minimisation Circles "(1) in Western India.

(1) These " Waste Minimisation Circles " are voluntary forums of industries in an industrial cluster. The objective is to collectively identify and exploit waste minimisation opportunities in member industries.

IMPORTANCE OF NATURAL RESOURCE EXPORTS

EXPORTS OF RESOURCE BASED INDUSTRIES, 1992



SOURCE : UN SITC TRADE STATISTICS, REVISION 2 : MONITOR COMPANY ANALYSIS

CII

3.2 Given the fact that there are numerous successful examples of waste reduction even in developed nations who employ better technologies and operate them better, the scope for cleaner industrial production in developing nations is far greater. Indeed, there is a greater need of programmes such as PRISMA of Holland, 3P of 3M etc. in countries like India.

4. MYTHS & BARRIERS

4.1 Notwithstanding the scope and successes that have been registered both in developed and developing countries alike, many myths still remain and barriers persist, hindering the progress towards CIP.

4.2 The first relates to the risk of impairing product quality - a myth that barricades the waste minimisation (WM), or CIP efforts the most. The second most important myth is that waste reduction options take much too long a time and do not offer quick results. Since WM or CIP efforts are often not able to eliminate the need of end-of-pipe solutions, they are condemned as measures that hardly help industrial units in complying with the law. This brings us to the third most important myth, where industry likes to see WM measures as comprehensive substitutes for pollution control facilities. Because they are not, industry seldom realises that it is forced to spend more on compliance triggered pollution control retrofits than really necessary. The fourth myth relates to the costs. Most industry people believe that production processes that are resource miserly, more

efficient and intrisincally clean ought to and do cost more - more than dirty technology and associated pollution control system put together. Finally, the myth also prevails that WM or CIP being a process of harnessing innovation, creativity to achieve continuous improvement is no different than the management practices they employ. Most industries therefore believe that they have already accomplished all the improvements that are possible - after all they know their productive assets best ! Hence, they tend to prefer compliance oriented one-time effort of establishing pollution control measures and be done with.

4.3 While, such myths need to be exploded once for all, there is a host of other barriers like the ones listed in Table - II which have to be removed, if cleaner Industrial Production has to become a reality in developing world. Infact, one of the major barrier is macro-economic environment where tariffs, taxes, interest rates etc. tend to negate, and make the benefit - cost ratio favourable to cheaper but dirty technologies. Obviously, restructuring of fiscal policy regimes by suitably dovetailing environmental considerations can greatly facilitate introduction and proliferation of CIP.

TABLE - II

BARRIERS TO CLEANER INDUSTRIAL PRODUCTION

1. Lack of concern for environment.
2. Lack of public/consumer pressure.
3. Media - specific legislations
4. Lack of enforcement
5. Reliance on " Command - and - Control " strategies as opposed to use of Market - Based Instruments.
6. Emphasis on quick-fix solutions
7. Lack of awareness / information
8. Lack of capital resources and concern for costs
9. Lack of adaptation support
10. Lack of R&D
11. Confusion in understanding difference between cleaner production techniques and technologies
12. Absence of demonstration units
13. Concern for competition constraining multiplier effect

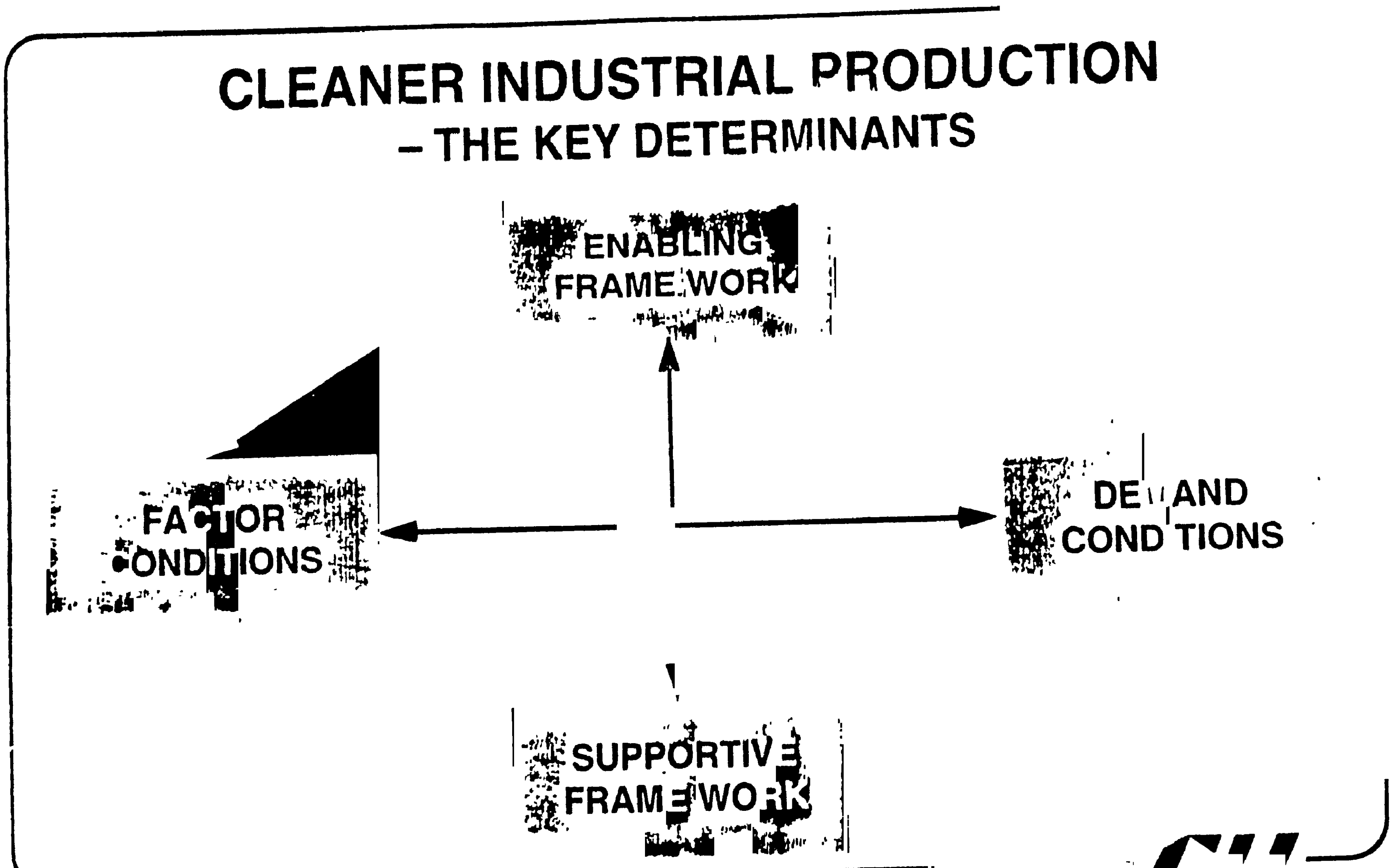
5. ENABLING STRATEGIES

5.1 In order to formulate effective strategies aimed at priority areas where developmental assistance could be most productively employed, it is necessary to examine the four major clusters of key determinants in the Cleaner Industrial Production Diamond (Figure - II).

5.2 Different developing countries are at different stages of their economic and industrial development. The status of basic factors of production in terms of their quantity, quality, speciality etc. therefore are likely to differ from country to country. As prevalent today, it is the factor conditions that would determine where the focus ought to be and how other key determinant clusters be influenced for the greatest impact.

5.3 If one were to look at India, it is perhaps apparent that we ought to concentrate on physical infrastructure, capital and knowledge resources as against natural and human resources or institutional infrastructure in some other countries because productivity growth in India is seemingly most constrained by limitations of physical infrastructure, lack of capital as reflected in higher interest rate and paucity of knowledge resources owing to deficiencies in education system as well as under-employment. All of them seem to be inhibiting introduction as well as development of CIP culture.

FIGURE - II


CLEANER INDUSTRIAL PRODUCTION
– THE KEY DETERMINANTS
ENABLING FRAME WORK
FACTOR CONDITIONS
DEMAND CONDITIONS
SUPPORTIVE FRAMEWORK

5.4 Enabling framework represents the cluster of those key determinants which relate to the context of investment on and use of CIP technologies. This appears to be a crucial area and yet the development assistance here, in the past, has been least directed. If conditions could be created where environmental concern, competition and enterprise to enterprise healthy rivalry flourishes together, the need for cleaner industrial production and resource efficient technologies is bound to grow. This growing but latent need then can be converted into actual absorption of CPI technologies through a prudent blend of conducive environmental and economic policies. Indeed, this " Double - E " factor can triple the " third E - Efficiency ".

5.5 The third cluster represents the consumer in a broader sense including industry.What kind of demand the consumer at home and in export significant area, the type of demand exerted by international consumer would dictate how green and how quickly the industry would shift towards cleaner industrial production. This is where the relevance of eco-labelling, environment audits, green financing, environmental reporting etc. comes in and where consumer is informed, educated and influenced to ask for environmentally sound industrial response.

5.6 The supportive framework comprises of those determinants that lend " sufficiency " to those which are " necessary ". The development assistance, by and large, and traditionally has been flowing in this cluster of key determinants. Information dissemination, training, R&D , adaptation support, demonstration etc. are typical examples of supportive activites. For instance, if the overall context is right, consumer is demanding, factors of production both qualitatively and quantitatively are in place, these supportive determinants can greatly facilitate flow and use of cleaner technologies. This area is the softest of all and perhaps that is the reason why it is the most treaded area for development assistance. It is not to hurl allegations, the only purpose of stating so is to put the entire conceptual analysis peresented above into proper perspective. The limited point is of according right priority to various key determinants in these four clusters and to understand their inter-relationships. Then only effective strategies for cleaner industrial production can be formulated.

6. TARGET AREAS FOR DEVELOPMENT ASSISTANCE

6.1 Considering the economic, technological and institutional set-up and status in most developing countries, it is reasonable to state that following are the most probable target areas of development assistance for WM and CIPs.

* Provision of Knowledge Resources
* Catalyse environmental awareness
* Influence Economic and Environmental Policy
* Induce use of Market Based Instruments
* Promote Eco-labelling and Green Certification Schemes
* Help establish Information, acquisition, processing storage and dissemination mechanisms
* Set up Demonstration Projects
* Strengthen Institutional Base in
    - Training
    - R&D and Adaptation

7. CONCLUSION

7.1 Cleaner Industrial Production is critical to Sustainable Development. It is so now and will remain so in foreseable future. International partnerships and cooperation can foster wider development, availability and use of cleaner production systems all over the world, provided environmental and economic concerns' could be alligned and harmonised.

*****

Forest Management

A N Chaturvedi
Tata Energy Research Institute

Forest Management

- A N Chaturvedi

Abstract

Forest Biomass provides fodder and fuel. This biomass also recycles nutrients and maintains the productivity of land. India's bovine population cannot be fed from the land area available for this purpose. Grazing, lopping of leaves and cutting of young trees for firewood are the most serious problems threatening the survival of the remaining forests. The demand of firewood can be met from about 40 million hectares of well managed forests. Proper management of forest is possible only with the cooperation of the local communities who are presently the greatest destroyers of the forests. Unless grazing is totally stopped in the remaining forest areas the future on this front is bleak. The vast areas of degraded lands continue to be overused. The climatic conditions in India are such easy to obtain as against 0.5 m^3/ ha/ year which we are getting at present due to the misuse to which our forests are subjected at present. This is also causing environmental damage which will adversely affect agricultural production and human health.

The requirement for firewood and fodder is very high in India. Most of the rural population is primarily dependent on biomass for energy. The population of cattle, sheep and goats which is assessed to be around 40 million is also dependent on biomass. Most of the land available for producing this biomass is in degraded condition. The total land area available for producing these requirements is not more than about 30% of the land area of the country. The production of biomass depends on the optimum use of soil and moisture. Unfortunately, in India both soil and water are neither properly conserved nor managed The country is largely dependent on monsoon. The water obtained during the rainy season has to be carefully used during the dry months. The structure of the soil is degraded to an extent that water does not percolate down, the aquifers therefore, do not fill up during the rainy season. The eroded soils fill up the river beds and the discharge of water carried in rivers is going down. The system of canals which is considered to be a panacea for agricultural production has laid waste large tracts of land due to seepage and consequent high alkalinity. The scenario for forest biomass production is bleak.

The degradation of land in India is very heavy and the process of degradation is continuing. The primary reason for this degradation is over grazing. It should be clearly realized that the total land area of the country cannot support the present bovine population. The effect of grazing has been studied in detail. A review of this

has been given in "Environmental Geology" by Prof K S Valdiya The relevant paragraphs are reproduced below·

Overgrazing is "literally eating away forest vegetation without giving it a chance to regenerate" In the Kumaun Himalaya, for example, the grazing pressure is 2 5 to 4 5 times greater than the carrying capacity of the forests The pounding and treading by hoofs of grazing cattle not only destroys the vegetal carpet, but also disaggregates the soil mantle. Cattle tracks later grow into gullies The greater the grazing stock, the more intense would be the erosion As already stated, the population of livestock in this country is growing as explosively as the human population, and the phenomenally mounting pressure of grazing is responsible for severe damage not only of the forests, but the soil as well The trees are defoliated, the nutritious elements of the pastures devoured, and the once lush hillsides extensively furrowed. Moreover, the soils of the overgrazed area are left with only 8-36% clays (compared to 50-69% in the unaffected soils of the area where entry of cattle is restricted) so that the stability is impaired owing to the deficiency of binding material. The clays also hold nutrients. Their deficiency thus diminishes the productivity of the soils.

In an experimental farm at Chander in Jaisalmer district (Rajasthan) following the removal of grass cover from a 60 m x 40 m patch, the wind blew away soil upto a depth of 50-60 cm in the first three years The arid land of Rajasthan (Thar) has expanded primarily due to the pressure of grazing. The live stock population here is very high- there were 25.5 units of cattle trampling and defoliating every hectare of pasture land. This explains why the once verdant land fed by the ancient Saraswati River has become a vast growing bowl of sands. A similar fate had overtaken the once green belts of Palestine, Israel, Libya and Algeria which today are deserts. (Page 185).

The continued trampling of fine-textured soil and defoliation have combined to produce deserts in many parts of Asia. Palestine from 200 B C. to A.D 200, used to feed 3 million people with its bountiful harvests; today it cannot support even 300,000 people, thanks to the activities of Bedouin farmers There were only 14,000 people in 1948 when the nation of Israel was born. The expansion of desertic conditions over wide parts of western India also bear growth of population of that terrain. A large part of what today is a dryland in Rajasthan was under cover of dense forests during the Mahabharat times (~ 3000-4000 years B.C); even at the time of Alexander's invasion the Sindhu valley was a forested tract (though Baluchistan had already become a desert by then). The climate must have been fairly humid as evident from the remains of the elephants that roamed the forests

of Rajasthan If man is responsible for causing desertification, he is also the greatest sufferer (Page 212)

The study of forestry in other countries shows that the high production is obtained in the forests of those countries where no free grazing is allowed. Sweden which is one of the best managed countries with regard to their forests has brought out in their report that change in the management of forest was brought about 100 years ago when grazing in the forest areas was totally stopped. This improved their forests and the present productivity is almost 10 times more than what we have in India today; inspite of the fact that Sweden has lesser number of growing days, being situated in a temperate climate It is essential that stall feeding is resorted to in India also and free grazing is stopped. The present productivity of India's forests is reckoned at 0.5 m^3/ha/yr. Considering the climate and the moisture regime, our average productivity should be around 8 m^3/ha/year. In controlled experiments this productivity has been achieved at average sites. In a good fertile soil as found in the Uttar Pradesh Tarai, productivity of up to 32 m^3/ha/yr has been achieved in 7 years old plantation of *Populus deltoides* clone D 67 (S.P.No.104).

The forest eco-system is self-sustainable. Due to ecological succession, the ground first gets covered with herbaceous vegetation. This gives way to perennial shrubs and then to trees. Every vegetation that grows upon the site produces organic matter and recycles nutrients. If this vegetation is removed from the sites, these degenerate and the productivity goes down appreciably. When the trees mature and are removed from the site they are replaced by younger growth which sustains on the nutrients and moisture available at site. The biomass produced at site, thus, functions as a source of supply of nutrients to the site. A small percentage may be removed but removal of a larger percentage of this biomass definitely harms the site. This is exactly what happens in India's forests where a large part of the biomass is removed with little consideration for the future productivity of the site

The demand of firewood estimated at about 300 million tonnes can easily be met from about 40 million hectare of the land area This is possible provided these sites are not grazed. It is also essential that the trees are harvested at the right time, i e after the trees have reached the stage of optimum growth and have recycled enough nutrients to site to sustain future productivity. Any biomass production system which does not care for future productivity of site will not sustain in the long run. Wherever trees are harvested, it is essential that enough biomass is left at the sites to recycle the organic matter sufficient for maintaining the productivity of the land. All trees whether growing in mixture or in pure crops improve sites if these are properly managed. Where sites deteriorate, it is not due to the choice of species but lack of

proper management. It is possible to meet the entire wood requirements of the country both for local consumption as well as for industries provided the grazing pressure is removed. The grazing is the biggest problem of our forests and community lands. Most of our forests are also subjected to removal of firewood in headloads. This firewood is generally obtained from the trees which are young Such trees have neither grown at their optimum rate nor have recycled enough nutrient to the site They are removed at a juvenile stage This is equivalent to the death of a child which has contributed nothing to the society, which in the present case is synonymous with land. This continuous removal of biomass is another serious problem which is eating into the future productivity of our land Biomass resources in this country need to be scientifically and properly managed Unfortunately, more and more areas are being taken away from scientific management and are being diverted to unscientific exploitation. Forests and pastures are subjected to non-sustainable use and we are eating into the capital. Biomass is renewable only as long as soil maintains its fertility.

Lopping trees for fodder is another serious problem that is destroying the productivity of our forest ecosystems. The leaves produce food for the growth of trees through photosynthesis. Leaves when they fall on the forest floor decompose and provide nutrients. Continuous removal of leaves as fodder takes away this vital component from the ecosystem. Removal of young immature leaves is even more harmful than removal of older leaves just before their natural shedding The programmes of providing leaf fodder from degraded lands are illogical The Oak forests in the hills and the Kardhai (*Anogeissus pendula*) forests in the Vindhyan tracts are disappearing at a fast pace due to this ill conceived practice Several studies on lopping intensity and schedules advocate controlled lopping for fodder, a practice that is difficult to follow on public lands.

Major part of India's forest are of the Tropical Dry type. This is the most threatened of the major tropical forest types. The cause of the severe habitat loss is straight forward. Dry forest are easily cleared with fires, the woody regeneration in fields or pastures is easily suppressed with fire. Furthermore, fire does not stay where you put it, many areas are unintentionally cleared. Tropical dry forest has 7 to 8 months rain free dry season. Many species of trees, vines and herbs are deciduous for two to six months. Its rainy season, during which 100 to 1000 mm of rain can fall may be as wet as a rain forest during this period In the dry season, the Sun penetrates to the forest floor, the leaf litter becomes very dry (and virtually ceases to decompose), water courses dry up or greatly diminish in flow, and day time relative humidity ranges from 20 to 60 per cent. The dry forest may appear uniformly green during the rainy season, but during the dry season the homogeneity changes into

a complex mosaic of tens of habitat types distinguished by the differential drying rates of different soils and exposures, different ages of succession and different vegetation types.

The threats to the tropical forests are multiple and complex, Much of the land is not under direct Government control. Even where the land is State controlled, it is under heavy pressure of local use. Even when they produce little forage the lands are used as exercising grounds for the domestic animals. The users of those lands - poor to very wealthy - are involved in neighbourhood functions and politics far in the future. The frontier between the forest and private lands is gone The audience is local. The power is local. The survival of these wild lands will depend on regional policy decisions by Government in conjunction with local community Many tropical forest species are relatively robust, largely due to their evolutionary history of exposure to seasonal changes. Thus, even tiny populations fragments and severely altered populations can be ecologically reworked into viable, interacting populations and complex habitats that are replicas or facsimiles of what once was on the site Habitats that appear well beyond recovery can be restored if the seed sources are present. Conserved areas of dry forest wild lands will be rich in plant and animal opportunistic species and may well be the only places where most of today's weeds survive. Weeds may be the most information - rich carriers of the genetic information for environmental toughness - information of obvious value in genetic engineering for crop species in harsh habitats.

The means that can be used to restore a tropical dry forest habitat are the following:

* Initiate and maintain a heavy flow of biological information, both biocultural and economic, from the site into the neighbouring social system. The process of restoration, and the biology and interactions of the organisms being restored, must become as familiar to the region as are its irrigation projects, school development and health programmes. This task is both more difficult and more sustainable if the conservation effort is focused on habitats, interactions, and caterpillars rather than on redwoods, lions, and condors.
* Stop man-made fires, hunting, cattle ranching, and other free-ranging perturbations. That is to say, give the site back to the remaining or adjacent dry forest organisms to recolonize by their own means However, while this multihectares regeneration appears to be natural, such megacolonization of pastures and fields does not occur anywhere in nature. It is also not risk-free; neighbouring blocks of pristine vegetation are likely to be severely altered by invasions of secondary successional organisms from the large and ever-growing areas under restoration

If some organisms are to be reintroduced from elsewhere, how far back in time shall we reach? Do we return the Pleistocene horse to Central American dry forest wildlands? How do we do that without adding its predators? If we put he tapir and white lipped peccary back into EL Salvador, do we also bring back their food plants? There are no correct choices per se, but it is clear that certain major dry forest areas must be set aside purely for agriculture and that no effort must be spared to maintain certain other (much smaller) areas as wildlands.

If the goal of restoration ecology is to conserve a maximum number of species, the management plan would be quite different than if the goal is to conserve habitats and interactions with whatever species they normally contain. Management directed at the conservation of a maximum number of species leads at least to the fragmentation of the wildland into a mosaic of successional types and ages and the introduction of species from other areas. If the goal is to conserve interactions as well as species, then the wildland manager must predict rather than simply react The interactions that are saved will depend on the management steps taken, which depend on the interactions that are desired (and there will be errors and surprise outcomes). Conservation abruptly graduates from the art of patrolling a boundary against poachers to a variety of technical activities, such as the research-based studies of ecological succession, evolutionary biology, species packing, competitive exclusion, and epidemiology.

Rain forest wildlands must be conserved within migratory reach of the dry forest areas that are subject to restoration. A dry forest does not exist unto itself and either does a rain forest. In Central America, the rain forest and the dry forest are the mutual recipients of each other's migrants - migrants that are important parts of the interactive structure that holds tropical habitats together. Birds migrating from Wisconsin to Costa Rica are not he only ecological link over large agroscapes

The dry forest is not only a collection of many kinds of habitats, each rich in unique species, but the members of a given habitat can be important interactants in adjacent habitats If only certain (usually species- rich) dry forest habitats are slated for conservation, one quickly discovers that a substantial portion of the species in those habitats spend critical parts of their lives in other nearby habitats. To put in another way, the conversion of highly deciduous forest on dry ridges to pasture may have adversely depressing effect on the species-richness of organisms in the very species-rich adjacent alluvial bottomlands.

The dry tropics contain adult remnants of a once thriving forest, juvenile from gradually dwindling seed reservoirs, and waifs from a yet intact wildlands

These organisms now stand on a trashed agroscape and will die without replacement. They are the living dead-all physiologically alive but can be regarded as dead if they were already lying in the litter If they flower, they fail to set seed (lack of pollinators). If they set seed, the seeds do not disperse (lack of seed dispersers) If seeds disperse, they do not develop as new members of their population (lack of adequate conditions for growth and development). If they develop, they do not thrive in a sustained population (the caprice of agroecosystem development eradicates conditions needed for population maintenance within a generation or two). These organisms are usually included in the lists of species in a region and are often used to demonstrate that a species is not threatened with extinction - even though it is Agroscapes, seemingly still supporting long lists of widespread species, are primed for massive extinction as individuals of these species senesce or are killed through intensification of contemporary agriculture. If all these species were to be physically removed as soon as they have no future, the catastrophe would be much more noticeable and would, therefore, arouse the sentiments normally associated with massive extinction.

The dry forest is more prone to these less visible catastrophes than is the rain forest, in which scraps of vegetation left when the forest is cleared die more quickly than do those of the dry forest. Thus the threatened plant species in dry forest are available for a longer time and can be used as basic stock in restoration projects (though the price paid is that they dilute the visual impact of a largely demolished forest).

Future prospects

Ignore the voice that demands that a monetary value be placed on a wildland or a species before it can be conserved Is that what you would do to determine the need for a public library, a public hospital, a public school? Can you tell us the dollar value of these institutions to your children? Are we to continue to be led by commercial interest to sanctify the production of material goods? The great majority of tropical humans live as draft animals; they are sold to the highest bidders along with the habitats that maintain them, and the purchasers are not generally benevolent. Through the swirl of changing market values, there will eventually come a day when the living organisms in a tropical wild land would be as doomed as would be libraries, if books were valued only for their paper pulp and the price of paper pulp were to rise.

Many organisms we believe to be rare are really endangered, and those we call endangered are in reality extinct. Guards will not save tropical wildlands The world's

Global environmental issues

Bharat Desai
Jawaharlal Nehru University

CONFERENCE ON ENVIRONMENTALIST LAW : MYTH OR REALITY ?

INSTITUTE OF ADVANCED LEGAL STUDIES, LONDON, 21 OCTOBER 1993.

Environmental Law : Some Reflections

Dr.Bharat Desai*

The global environment movement is generally considered to be about two decades old, since the first U.N. Conference on Human Environment (Stockholm, 1972). The diagnosis of environmental problems at this historic conference unleashed a spate of administrative and legislative measures in both developed as well as developing countries. The smouldering ecological crisis has provided an impetus to the centralization of law-making process at international level, as increasing number of international environmental agreements have taken shape. The volume of 'soft law', through standard-setting process by states, has also gone up manifold.

The regulatory mechanism evolved by the international community to address environmental problems has heralded a sound body of international environmental law. Several regional organizations (a la the European Community) have also set in motion environmental regulations and action plans. However the most noticeable trend is discernible at the national level. The environmental renaissance which has swept across, during the journey from Stockholm Conference to Rio Earth Summit (1972-1992),

*Assistant Professor in Environmental Law, International Legal Studies Division, School of International Studies, Jawaharlal Nehru University, New Delhi - 110 067, India.

has brought about world-wide phenomenal growth in environmental legislations. The importance of this development lies in the fact that enforcement of regulatory measures has to take place at the national level. The systematic growth of this body of law could not but have been recognised as 'environmental law'.

The international community has gradually awakened to the importance of clean and hygienic environment for human existence. Now increasing number of ministerial declarations and conference statements acknowledge this fact. For instance the Rio Declaration (1992) unequivocally recognised that "all human beings are entitled to a healthy and productive life in harmony with nature". In the Commonwealth too, the Langkawi Declaration on Environment (1989) expressed concern at the "serious deterioration in the environment and the threat this poses to the well-being of present and future generations". There is, however, no consensus yet at the international level regarding the right to environment protection as a fundamental human right. Some scattered efforts are visible in this direction in national jurisdictions to recognize the right to environment protection.

In fact significant progress has taken place in this sphere through judicial interpretations in several countries. In a sense judicial decisions have not only played the vanguard role in protecting the citizens' right to wholesome environment but also crystalized legal principles, through

activist interpretation, which forms part of emerging environmental law. As a result environmental law is no longer an obscure body of law shrouded in mystery. The fact that legal teaching and research worldwide have also taken note of it and are being suitably revamped, proves it. The idea has gained currency now that specialised environmental tribunals need to be constituted in view of technical nature of environmental cases and to avoid routine court delays. Even the International Court of Justice (ICJ) recently (July 1993) decided to form a standing Special Seven Member Chamber for environmental matters.

As the volume of environmental law (both 'hard law' and 'soft law') grows, the question of adjudication will gain prominence. As the ICJ has a limited jurisdiction, it will be interesting to see as and when the Court decides a case on environmental matter. Therefore, as the seriousness for environmental problems grows, the national courts are having a greater role to play in interpreting the law and grapling with the challenge posed by an evolving body of law. The limited amount of jurisprudence already produced by the courts does offer a promising future. One of the important problems which may confront the judiciary is that the courts are, in general, conservative in nature. Therefore it not only calls for innovative approaches but also to some extent an "activist" role. This may be especially relevant for countries with

Common Law background. The significance of such a judicial activism largely depends upon the judicial set up in a country, awareness on the part of the local communities as well as social activists. There are several countries in the Commonwealth (a la India, Malaysia etc.) having public interest environmental litigation experience. The Indian experience in this respect is the most successful one.

The Indian Supreme Court has played the role of judicial activism with great finesse. In fact a remarkable body of environmental jurisprudence has emerged in the past decade or so. In deciding the environmental cases (e.g. Sriram Gas Leakage case) the apex court has gone beyond some of the common law precedents too -- (e.g. Rylands Vs. Fletcher). The Court has not only liberalised the rule of locus standi to enable concerned persons to seek the Court's indulgence under its power of judicial review (Article 32) for violation of Fundamental Rights. In the process the Court has not confined itself to preventiv remedies. It has issued directions for remedial justice too. Through the variety of techniques of judicial activism, Supreme Court of India has converted much of the constitution litigation into public interest litigation (PIL). The PIL in India has been primarily judge-led and even to some extent judge-induced.

The growing volume of public interest environmental litigation (PIEL) in India has been strongly nurtured by

the understanding that judges do not merely find the law. This did give jolt to the traditional Anglo-Saxon myth that judges do not make law. In fact some of the judges pondered over the role of a judge in a traumatically changing society such as India. Former Chief Justice Bhagwati has, in fact, argued that judges do take part in the law-making process and regarded judicial activism as a necessary and inevitable part of the judicial process. The Supreme Court of India and the state High Courts have often deliberately jettissioned apologist postures in this regard.

The volume of environmental law both at international and national levels has been growing slowly but steadily. The judicial role in a country like India has been very important in giving a boost to it. The subject of role of a judge in the law-making process is very controversial. Yet at the same time it is also true that the judges often do make law (through innovative interpretations) without saying so. This is true in respect of the International Court of Justice, which has contributed a great deal in the development of traditional international law, in some of its landmark judicial decisions and advisory opinions. It is all the more pertinent in the national jurisdictions. In this context one is reminded of Lord Reid's observation:

> There was a time when it was thought almost indecent to suggest that judges make law -- they only declare it. Those with a taste for fairy tales deem to have thought that

> in some Alladdin's cave there is hidden the Common Law, in all its splendor and that on a Judge's appointment there descends on him knowledge of the magic words Open Sesame. Bad decisions are given when the judge has muddled the password and the wrong door opens. But we do not believe in fairy tales any more.
>
> [Reid, The Judge as Lawmaker, 12 J.S.P.T.L. 12 (1972).]

No ready-made formulae can, however, be suggested for such judicial activism in environmental matters. But broadening of the judicial horizons can be of great help, among others, in enunciating a right to environment protection, in progressive interpretation of legislative provisions, in bridging the legal lacunae and in galvanizing the enforcement machinery into action. The Supreme Court of India has weilded its judicial power with considerable finesse in issuing directions in some of the landmark public interest environmental litigations e.g. Doon Valley case, Sriram Gas Leakage case, Ganga Pollution case, Sariska Bio-Reserve case, Taj Mahal case, Stone Crushers case etc. The approach adopted by the Indian Supreme Court does offer an occasion for the British legal system to ponder over.

U N I T E D

N A T I O N S

FRAMEWORK

CONVENTION

ON CLIMATE

C H A N G E

Published by the UNEP/WMO Information Unit on Climate Change (IUCC)
on behalf of the Interim Secretariat of the Convention.

For more information contact:

IUCC
c/o UNEP
C.P 356
1219 Châtelaine (Geneva)
Switzerland
Fax: (41-22) 797 3464
E-mail: IUCC@gn.apc.org.

Climate Change Secretariat
Palais des Nations
1211 Geneva 10
Switzerland
Fax. (41-22) 788 3823

This booklet contains the text of the United Nations Framework Convention on Climate Change, which starts on page 2.

Introduction

During the 1980s, scientific evidence about the possibility of global climate change led to growing public concern. By 1990, a series of international conferences had issued urgent calls for a global treaty to address the problem. The United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) responded by establishing an intergovernmental working group to prepare for treaty negotiations. Rapid progress was made, in part because of work by the Intergovernmental Panel on Climate Change (IPCC) and by meetings such as the 1990 Second World Climate Conference.

In response to the working group's proposal, the United Nations General Assembly at its 1990 session set up the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC). The INC/FCCC was given a mandate to draft a framework convention and any related legal instruments it considered necessary. Negotiators from over 150 States met during five sessions between February 1991 and May 1992 They adopted the United Nations Framework Convention on Climate Change on 9 May 1992 at UN Headquarters in New York.

Soon after, at the June 1992 United Nations Conference on Environment and Development (known as the Rio "Earth Summit"), the Convention received 155 signatures. Other States have since signed, and a growing number have ratified. The Convention will enter into force 90 days after the 50th ratification. The first session of the Conference of the Parties must then be convened within the following year. This meeting of all ratifying States will be hosted by Germany, possibly in early 1995 The INC/FCCC, which is continuing with important preparatory work, will then be dissolved and the Conference of the Parties will take over responsibility for the lengthy process of implementing the Convention.

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

The Parties to this Convention,

Acknowledging that change in the Earth's climate and its adverse effects are a common concern of humankind,

Concerned that human activities have been substantially increasing the atmospheric concentrations of greenhouse gases, that these increases enhance the natural greenhouse effect, and that this will result on average in an additional warming of the Earth's surface and atmosphere and may adversely affect natural ecosystems and humankind,

Noting that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs,

Aware of the role and importance in terrestrial and marine ecosystems of sinks and reservoirs of greenhouse gases,

Noting that there are many uncertainties in predictions of climate change, particularly with regard to the timing, magnitude and regional patterns thereof,

Acknowledging that the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions,

Recalling the pertinent provisions of the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972,

Recalling also that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction,

Reaffirming the principle of sovereignty of States in international cooperation to address climate change,

Recognizing that States should enact effective environmental legislation, that environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply, and that standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries,

Recalling the provisions of General Assembly resolution 44/228 of 22 December 1989 on the United Nations Conference on Environment and Development, and resolutions 43/53 of 6 December 1988, 44/207 of 22 December 1989, 45/212 of 21 December 1990 and 46/169 of 19 December 1991 on protection of global climate for present and future generations of mankind,

Recalling also the provisions of General Assembly resolution 44/206 of 22 December 1989 on the possible adverse effects of sea-level rise on islands and coastal areas, particularly low-lying coastal areas and the pertinent provisions of General Assembly resolution 44/172 of 19 December 1989 on the implementation of the Plan of Action to Combat Desertification,

Recalling further the Vienna Convention for the Protection of the Ozone Layer, 1985, and the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, as adjusted and amended on 29 June 1990,

Noting the Ministerial Declaration of the Second World Climate Conference adopted on 7 November 1990,

Conscious of the valuable analytical work being conducted by many States on climate change and of the important contributions of the World Meteorological Organization, the United Nations Environment Programme and other organs, organizations and bodies of the United Nations system, as well as other international and intergovernmental bodies, to the exchange of results of scientific research and the coordination of research,

Recognizing that steps required to understand and address climate change will be environmentally, socially and economically most effective if they are based on relevant scientific, technical and economic considerations and continually re-evaluated in the light of new findings in these areas,

Recognizing that various actions to address climate change can be justified economically in their own right and can also help in solving other environmental problems,

Recognizing also the need for developed countries to take immediate action in a flexible manner on the basis of clear priorities, as a first step towards comprehensive response strategies at the global, national and, where agreed, regional levels that take into account all greenhouse gases, with due consideration of their relative contributions to the enhancement of the greenhouse effect,

Recognizing further that low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas or areas liable to floods, drought and desertification, and developing countries with fragile mountainous ecosystems are particularly vulnerable to the adverse effects of climate change,

Recognizing the special difficulties of those countries, especially developing countries, whose economies are particularly dependent on fossil fuel production, use and exportation, as a consequence of action taken on limiting greenhouse gas emissions,

Affirming that responses to climate change should be coordinated with social and economic development in an integrated manner with a view to avoiding adverse impacts on the latter, taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty,

Recognizing that all countries, especially developing countries, need access to resources required to achieve sustainable social and economic development and that, in order for developing countries to progress towards that goal, their energy consumption will need to grow taking into account the possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general, including through the application of new technologies on terms which make such an application economically and socially beneficial,

Determined to protect the climate system for present and future generations,

Have agreed as follows:

ARTICLE 1

DEFINITIONS *

For the purposes of this Convention:

1. "Adverse effects of climate change" means changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare.

* Titles of articles are included solely to assist the reader

2. "Climate change" means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

3. "Climate system" means the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions.

4 "Emissions" means the release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time.

5 "Greenhouse gases" means those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.

6 "Regional economic integration organization" means an organization constituted by sovereign States of a given region which has competence in respect of matters governed by this Convention or its protocols and has been duly authorized, in accordance with its internal procedures, to sign, ratify, accept, approve or accede to the instruments concerned.

7 "Reservoir" means a component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored.

8. "Sink" means any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.

9 "Source" means any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere.

ARTICLE 2

OBJECTIVE

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner

ARTICLE 3

PRINCIPLES

In their actions to achieve the objective of the Convention and to implement its provisions, the Parties shall be guided, inter alia, by the following:

1 The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.

2. The specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration.

3 The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be carried out cooperatively by interested Parties.

4. The Parties have a right to, and should, promote sustainable development. Policies and measures to protect the climate system against human-induced change should be appropriate for the specific conditions of each Party and should be integrated with national development programmes, taking into account that economic development is essential for adopting measures to address climate change.

5 The Parties should cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties, thus enabling them better to address the problems of climate change. Measures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade

< **ARTICLE 4**

COMMITMENTS

1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

(a) [Develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties;]

(b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change;

(c) Promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors;

(d) Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems;

(e) Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods,

(f) Take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example impact assessments, formulated and determined nationally, with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change;

(g) Promote and cooperate in scientific, technological, technical, socio-economic and other research, systematic observation and development of data archives related to the climate system and intended to further the understanding and to reduce or eliminate the remaining uncertainties regarding the causes, effects, magnitude and timing of climate change and the economic and social consequences of various response strategies,

(h) Promote and cooperate in the full, open and prompt exchange of relevant scientific, technological, technical, socio-economic and legal information related to the climate system and climate change, and to the economic and social consequences of various response strategies,

(i) Promote and cooperate in education, training and public awareness related to climate change and encourage the widest participation in this process, including that of non-governmental organizations; and

(j) Communicate to the Conference of the Parties information related to implementation, in accordance with Article 12.

2. The developed country Parties and other Parties included in Annex I commit themselves specifically as provided for in the following.

(a) Each of these Parties shall adopt national 1/ policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs. These policies and measures will demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of the Convention, recognizing that the return by the end of the present decade to earlier levels of anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol would contribute to such modification, and taking into account the differences in these Parties' starting points and approaches, economic structures and resource bases, the need to maintain strong and sustainable economic growth, available technologies and other individual circumstances, as well as the need for equitable and appropriate contributions by each of these Parties to the global effort regarding that objective. These Parties may implement such policies and measures jointly with other Parties and may assist other Parties in contributing to the achievement of the objective of the Convention and, in particular, that of this subparagraph,

---

1/ This includes policies and measures adopted by regional economic integration organizations.

(b) In order to promote progress to this end, each of these Parties shall communicate, within six months of the entry into force of the Convention for it and periodically thereafter, and in accordance with Article 12, detailed information on its policies and measures referred to in subparagraph (a) above, as well as on its resulting projected anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol for the period referred to in subparagraph (a), with the aim of returning individually or jointly to their 1990 levels these anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol. This information will be reviewed by the Conference of the Parties, at its first session and periodically thereafter, in accordance with Article 7;

(c) Calculations of emissions by sources and removals by sinks of greenhouse gases for the purposes of subparagraph (b) above should take into account the best available scientific knowledge, including of the effective capacity of sinks and the respective contributions of such gases to climate change. The Conference of the Parties shall consider and agree on methodologies for these calculations at its first session and review them regularly thereafter;

(d) The Conference of the Parties shall, at its first session, review the adequacy of subparagraphs (a) and (b) above. Such review shall be carried out in the light of the best available scientific information and assessment on climate change and its impacts, as well as relevant technical, social and economic information. Based on this review, the Conference of the Parties shall take appropriate action, which may include the adoption of amendments to the commitments in subparagraphs (a) and (b) above. The Conference of the Parties, at its first session, shall also take decisions regarding criteria for joint implementation as indicated in subparagraph (a) above. A second review of subparagraphs (a) and (b) shall take place not later than 31 December 1998, and thereafter at regular intervals determined by the Conference of the Parties, until the objective of the Convention is met;

(e) Each of these Parties shall:

(i) Coordinate as appropriate with other such Parties, relevant economic and administrative instruments developed to achieve the objective of the Convention; and

(ii) Identify and periodically review its own policies and practices which encourage activities that lead to greater levels of anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol than would otherwise occur;

(f) The Conference of the Parties shall review, not later than 31 December 1998, available information with a view to taking decisions regarding such amendments to the lists in Annexes I and II as may be appropriate, with the approval of the Party concerned;

(g) Any Party not included in Annex I may, in its instrument of ratification, acceptance, approval or accession, or at any time thereafter, notify the Depositary that it intends to be bound by subparagraphs (a) and (b) above. The Depositary shall inform the other signatories and Parties of any such notification.

3. The developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures that are covered by paragraph 1 of this Article and that are agreed between a developing country Party and the international entity or entities referred to in Article 11, in accordance with that Article. The implementation of these commitments shall take into account the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country Parties.

4. The developed country Parties and other developed Parties included in Annex II shall also assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.

5. The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies.

6. In the implementation of their commitments under paragraph 2 above, a certain degree of flexibility shall be allowed by the Conference of the Parties to the Parties included in Annex I undergoing the process of transition to a market economy, in order to enhance the ability of these Parties to address climate change, including with regard to the historical level of anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol chosen as a reference

7 The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties.

8 In the implementation of the commitments in this Article, the Parties shall give full consideration to what actions are necessary under the Convention, including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and/or the impact of the implementation of response measures, especially on:

(a) Small island countries;

(b) Countries with low-lying coastal areas;

(c) Countries with arid and semi-arid areas, forested areas and areas liable to forest decay,

(d) Countries with areas prone to natural disasters;

(e) Countries with areas liable to drought and desertification,

(f) Countries with areas of high urban atmospheric pollution;

(g) Countries with areas with fragile ecosystems, including mountainous ecosystems,

(h) Countries whose economies are highly dependent on income generated from the production, processing and export, and/or on consumption of fossil fuels and associated energy-intensive products; and

(i) Land-locked and transit countries.

Further, the Conference of the Parties may take actions, as appropriate, with respect to this paragraph.

9 The Parties shall take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology

10 The Parties shall, in accordance with Article 10, take into consideration in the implementation of the commitments of the Convention the situation of Parties, particularly developing country Parties, with economies that are vulnerable to the adverse effects of the implementation of measures to respond to climate change This applies notably to Parties with economies that are highly dependent on income generated from the production, processing and export, and/or consumption of fossil fuels and associated energy-intensive products and/or the use of fossil fuels for which such Parties have serious difficulties in switching to alternatives

ARTICLE 5

RESEARCH AND SYSTEMATIC OBSERVATION

In carrying out their commitments under Article 4, paragraph 1(g), the Parties shall:

(a) Support and further develop, as appropriate, international and intergovernmental programmes and networks or organizations aimed at defining, conducting, assessing and financing research, data collection and systematic observation, taking into account the need to minimize duplication of effort;

(b) Support international and intergovernmental efforts to strengthen systematic observation and national scientific and technical research capacities and capabilities, particularly in developing countries, and to promote access to, and the exchange of, data and analyses thereof obtained from areas beyond national jurisdiction; and

(c) Take into account the particular concerns and needs of developing countries and cooperate in improving their endogenous capacities and capabilities to participate in the efforts referred to in subparagraphs (a) and (b) above.

ARTICLE 6

EDUCATION, TRAINING AND PUBLIC AWARENESS

In carrying out their commitments under Article 4, paragraph 1(i), the Parties shall:

(a) Promote and facilitate at the national and, as appropriate, subregional and regional levels, and in accordance with national laws and regulations, and within their respective capacities.

(i) The development and implementation of educational and public awareness programmes on climate change and its effects;

(ii) Public access to information on climate change and its effects;

(iii) Public participation in addressing climate change and its effects and developing adequate responses; and

(iv) Training of scientific, technical and managerial personnel.

(b) Cooperate in and promote, at the international level, and, where appropriate, using existing bodies:

(i) The development and exchange of educational and public awareness material on climate change and its effects; and

(ii) The development and implementation of education and training programmes, including the strengthening of national institutions and the exchange or secondment of personnel to train experts in this field, in particular for developing countries.

ARTICLE 7

CONFERENCE OF THE PARTIES

1 A Conference of the Parties is hereby established.

2 The Conference of the Parties, as the supreme body of this Convention, shall keep under regular review the implementation of the Convention and any related legal instruments that the Conference of the Parties may adopt, and shall make, within its mandate, the decisions necessary to promote the effective implementation of the Convention. To this end, it shall:

(a) Periodically examine the obligations of the Parties and the institutional arrangements under the Convention, in the light of the objective of the Convention, the experience gained in its implementation and the evolution of scientific and technological knowledge;

(b) Promote and facilitate the exchange of information on measures adopted by the Parties to address climate change and its effects, taking into account the differing circumstances, responsibilities and capabilities of the Parties and their respective commitments under the Convention,

(c) Facilitate, at the request of two or more Parties, the coordination of measures adopted by them to address climate change and its effects, taking into account the differing circumstances, responsibilities and capabilities of the Parties and their respective commitments under the Convention,

(d) Promote and guide, in accordance with the objective and provisions of the Convention, the development and periodic refinement of comparable methodologies, to be agreed on by the Conference of the Parties, inter alia, for preparing inventories of greenhouse gas emissions by sources and removals by sinks, and for evaluating the effectiveness of measures to limit the emissions and enhance the removals of these gases,

(e) Assess, on the basis of all information made available to it in accordance with the provisions of the Convention, the implementation of the Convention by the Parties, the overall effects of the measures taken pursuant to the Convention, in particular environmental, economic and social effects as well as their cumulative impacts and the extent to which progress towards the objective of the Convention is being achieved;

(f) Consider and adopt regular reports on the implementation of the Convention and ensure their publication;

(g) Make recommendations on any matters necessary for the implementation of the Convention;

(h) Seek to mobilize financial resources in accordance with Article 4, paragraphs 3, 4 and 5, and Article 11;

(i) Establish such subsidiary bodies as are deemed necessary for the implementation of the Convention;

(j) Review reports submitted by its subsidiary bodies and provide guidance to them;

(k) Agree upon and adopt, by consensus, rules of procedure and financial rules for itself and for any subsidiary bodies,

(l) Seek and utilize, where appropriate, the services and cooperation of, and information provided by, competent international organizations and intergovernmental and non-governmental bodies; and

(m) Exercise such other functions as are required for the achievement of the objective of the Convention as well as all other functions assigned to it under the Convention.

3. The Conference of the Parties shall, at its first session, adopt its own rules of procedure as well as those of the subsidiary bodies established by the Convention, which shall include decision-making procedures for matters not already covered by decision-making procedures stipulated in the Convention. Such procedures may include specified majorities required for the adoption of particular decisions

4. The first session of the Conference of the Parties shall be convened by the interim secretariat referred to in Article 21 and shall take place not later than one year after the date of entry into force of the Convention Thereafter, ordinary sessions of the Conference of the Parties shall be held every year unless otherwise decided by the Conference of the Parties

5. Extraordinary sessions of the Conference of the Parties shall be held at such other times as may be deemed necessary by the Conference, or at the written request of any Party, provided that, within six months of the request being communicated to the Parties by the secretariat, it is supported by at least one third of the Parties

6. The United Nations, its specialized agencies and the International Atomic Energy Agency, as well as any State member thereof or observers thereto not Party to the Convention, may be represented at sessions of the Conference of the Parties as observers. Any body or agency, whether national or international, governmental or non-governmental, which is qualified in matters covered by the Convention, and which has informed the secretariat of its wish to be represented at a session of the Conference of the Parties as an observer, may be so admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure adopted by the Conference of the Parties.

ARTICLE 8

SECRETARIAT

1 A secretariat is hereby established.

2 The functions of the secretariat shall be:

(a) To make arrangements for sessions of the Conference of the Parties and its subsidiary bodies established under the Convention and to provide them with services as required,

(b) To compile and transmit reports submitted to it;

(c) To facilitate assistance to the Parties, particularly developing country Parties, on request, in the compilation and communication of information required in accordance with the provisions of the Convention;

(d) To prepare reports on its activities and present them to the Conference of the Parties;

(e) To ensure the necessary coordination with the secretariats of other relevant international bodies,

(f) To enter, under the overall guidance of the Conference of the Parties, into such administrative and contractual arrangements as may be required for the effective discharge of its functions; and

(g) To perform the other secretariat functions specified in the Convention and in any of its protocols and such other functions as may be determined by the Conference of the Parties

3 The Conference of the Parties, at its first session, shall designate a permanent secretariat and make arrangements for its functioning

ARTICLE 9

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE

1. A subsidiary body for scientific and technological advice is hereby established to provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely information and advice on scientific and technological matters relating to the Convention This body shall be open to participation by all Parties and shall be multidisciplinary. It shall comprise government representatives competent in the relevant field of expertise It shall report regularly to the Conference of the Parties on all aspects of its work

2. Under the guidance of the Conference of the Parties, and drawing upon existing competent international bodies, this body shall:

(a) Provide assessments of the state of scientific knowledge relating to climate change and its effects;

(b) Prepare scientific assessments on the effects of measures taken in the implementation of the Convention;

(c) Identify innovative, efficient and state-of-the-art technologies and know-how and advise on the ways and means of promoting development and/or transferring such technologies;

(d) Provide advice on scientific programmes, international cooperation in research and development related to climate change, as well as on ways and means of supporting endogenous capacity-building in developing countries; and

(e) Respond to scientific, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.

3. The functions and terms of reference of this body may be further elaborated by the Conference of the Parties.

ARTICLE 10.

SUBSIDIARY BODY FOR IMPLEMENTATION

1. A subsidiary body for implementation is hereby established to assist the Conference of the Parties in the assessment and review of the effective implementation of the Convention. This body shall be open to participation by all Parties and comprise government representatives who are experts on matters related to climate change. It shall report regularly to the Conference of the Parties on all aspects of its work.

2. Under the guidance of the Conference of the Parties, this body shall.

(a) Consider the information communicated in accordance with Article 12, paragraph 1, to assess the overall aggregated effect of the steps taken by the Parties in the light of the latest scientific assessments concerning climate change;

(b) Consider the information communicated in accordance with Article 12, paragraph 2, in order to assist the Conference of the Parties in carrying out the reviews required by Article 4, paragraph 2(d), and

(c) Assist the Conference of the Parties, as appropriate, in the preparation and implementation of its decisions.

ARTICLE 11

FINANCIAL MECHANISM

1. A mechanism for the provision of financial resources on a grant or concessional basis, including for the transfer of technology, is hereby defined. It shall function under the guidance of and be accountable to the Conference of the Parties, which shall decide on its policies, programme priorities and eligibility criteria related to this Convention. Its operation shall be entrusted to one or more existing international entities.

2. The financial mechanism shall have an equitable and balanced representation of all Parties within a transparent system of governance

3. The Conference of the Parties and the entity or entities entrusted with the operation of the financial mechanism shall agree upon arrangements to give effect to the above paragraphs, which shall include the following:

(a) Modalities to ensure that the funded projects to address climate change are in conformity with the policies, programme priorities and eligibility criteria established by the Conference of the Parties;

(b) Modalities by which a particular funding decision may be reconsidered in light of these policies, programme priorities and eligibility criteria;

(c) Provision by the entity or entities of regular reports to the Conference of the Parties on its funding operations, which is consistent with the requirement for accountability set out in paragraph 1 above; and

(d) Determination in a predictable and identifiable manner of the amount of funding necessary and available for the implementation of this Convention and the conditions under which that amount shall be periodically reviewed.

4. The Conference of the Parties shall make arrangements to implement the above-mentioned provisions at its first session, reviewing and taking into account the interim arrangements referred to in Article 21, paragraph 3, and shall decide whether these interim arrangements shall be maintained Within four years thereafter, the Conference of the Parties shall review the financial mechanism and take appropriate measures

5 The developed country Parties may also provide and developing country Parties avail themselves of, financial resources related to the implementation of the Convention through bilateral, regional and other multilateral channels

ARTICLE 12

COMMUNICATION OF INFORMATION RELATED TO IMPLEMENTATION

1. In accordance with Article 4, paragraph 1, each Party shall communicate to the Conference of the Parties, through the secretariat, the following elements of information:

(a) A national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties,

(b) A general description of steps taken or envisaged by the Party to implement the Convention; and

(c) Any other information that the Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, material relevant for calculations of global emission trends.

2. Each developed country Party and each other Party included in Annex I shall incorporate in its communication the following elements of information.

(a) A detailed description of the policies and measures that it has adopted to implement its commitment under Article 4, paragraphs 2(a) and 2(b); and

(b) A specific estimate of the effects that the policies and measures referred to in subparagraph (a) immediately above will have on anthropogenic emissions by its sources and removals by its sinks of greenhouse gases during the period referred to in Article 4, paragraph 2(a)

3 In addition, each developed country Party and each other developed Party included in Annex II shall incorporate details of measures taken in accordance with Article 4, paragraphs 3, 4 and 5

4 Developing country Parties may, on a voluntary basis, propose projects for financing, including specific technologies, materials, equipment, techniques or practices that would be needed to implement such projects, along with, if possible, an estimate of all incremental costs, of the reductions of emissions and increments of removals of greenhouse gases, as well as an estimate of the consequent benefits

5. Each developed country Party and each other Party included in Annex I shall make its initial communication within six months of the entry into force of the Convention for that Party. Each Party not so listed shall make its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources in accordance with Article 4, paragraph 3. Parties that are least developed countries may make their initial communication at their discretion. The frequency of subsequent communications by all Parties shall be determined by the Conference of the Parties, taking into account the differentiated timetable set by this paragraph.

6. Information communicated by Parties under this Article shall be transmitted by the secretariat as soon as possible to the Conference of the Parties and to any subsidiary bodies concerned. If necessary, the procedures for the communication of information may be further considered by the Conference of the Parties

7. From its first session, the Conference of the Parties shall arrange for the provision to developing country Parties of technical and financial support, on request, in compiling and communicating information under this Article, as well as in identifying the technical and financial needs associated with proposed projects and response measures under Article 4. Such support may be provided by other Parties, by competent international organizations and by the secretariat, as appropriate.

8. Any group of Parties may, subject to guidelines adopted by the Conference of the Parties, and to prior notification to the Conference of the Parties, make a joint communication in fulfilment of their obligations under this Article, provided that such a communication includes information on the fulfilment by each of these Parties of its individual obligations under the Convention

9. Information received by the secretariat that is designated by a Party as confidential, in accordance with criteria to be established by the Conference of the Parties, shall be aggregated by the secretariat to protect its confidentiality before being made available to any of the bodies involved in the communication and review of information.

10. Subject to paragraph 9 above, and without prejudice to the ability of any Party to make public its communication at any time, the secretariat shall make communications by Parties under this Article publicly available at the time they are submitted to the Conference of the Parties

ARTICLE 13

RESOLUTION OF QUESTIONS REGARDING IMPLEMENTATION

The Conference of the Parties shall, at its first session, consider the establishment of a multilateral consultative process, available to Parties on their request, for the resolution of questions regarding the implementation of the Convention.

ARTICLE 14

SETTLEMENT OF DISPUTES

1 In the event of a dispute between any two or more Parties concerning the interpretation or application of the Convention, the Parties concerned shall seek a settlement of the dispute through negotiation or any other peaceful means of their own choice.

2 When ratifying, accepting, approving or acceding to the Convention, or at any time thereafter, a Party which is not a regional economic integration organization may declare in a written instrument submitted to the Depositary that, in respect of any dispute concerning the interpretation or application of the Convention, it recognizes as compulsory ipso facto and without special agreement, in relation to any Party accepting the same obligation:

(a) Submission of the dispute to the International Court of Justice, and/or

(b) Arbitration in accordance with procedures to be adopted by the Conference of the Parties as soon as practicable, in an annex on arbitration

A Party which is a regional economic integration organization may make a declaration with like effect in relation to arbitration in accordance with the procedures referred to in subparagraph (b) above

3 A declaration made under paragraph 2 above shall remain in force until it expires in accordance with its terms or until three months after written notice of its revocation has been deposited with the Depositary

4 A new declaration, a notice of revocation or the expiry of a declaration shall not in any way affect proceedings pending before the International Court of Justice or the arbitral tribunal, unless the parties to the dispute otherwise agree

5. Subject to the operation of paragraph 2 above, if after twelve months following notification by one Party to another that a dispute exists between them, the Parties concerned have not been able to settle their dispute through the means mentioned in paragraph 1 above, the dispute shall be submitted, at the request of any of the parties to the dispute, to conciliation.

6. A conciliation commission shall be created upon the request of one of the parties to the dispute. The commission shall be composed of an equal number of members appointed by each party concerned and a chairman chosen jointly by the members appointed by each party. The commission shall render a recommendatory award, which the parties shall consider in good faith.

7. Additional procedures relating to conciliation shall be adopted by the Conference of the Parties, as soon as practicable, in an annex on conciliation

8. The provisions of this Article shall apply to any related legal instrument which the Conference of the Parties may adopt, unless the instrument provides otherwise.

ARTICLE 15

AMENDMENTS TO THE CONVENTION

1. Any Party may propose amendments to the Convention.

2. Amendments to the Convention shall be adopted at an ordinary session of the Conference of the Parties. The text of any proposed amendment to the Convention shall be communicated to the Parties by the secretariat at least six months before the meeting at which it is proposed for adoption. The secretariat shall also communicate proposed amendments to the signatories to the Convention and, for information, to the Depositary.

3. The Parties shall make every effort to reach agreement on any proposed amendment to the Convention by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the amendment shall as a last resort be adopted by a three-fourths majority vote of the Parties present and voting at the meeting. The adopted amendment shall be communicated by the secretariat to the Depositary, who shall circulate it to all Parties for their acceptance.

4. Instruments of acceptance in respect of an amendment shall be deposited with the Depositary. An amendment adopted in accordance with paragraph 3 above shall enter into force for those Parties having accepted it on the ninetieth day after the date of receipt by the Depositary of an instrument of acceptance by at least three fourths of the Parties to the Convention.

5. The amendment shall enter into force for any other Party on the ninetieth day after the date on which that Party deposits with the Depositary its instrument of acceptance of the said amendment.

6. For the purposes of this Article, "Parties present and voting" means Parties present and casting an affirmative or negative vote.

ARTICLE 16

ADOPTION AND AMENDMENT OF ANNEXES TO THE CONVENTION

1. Annexes to the Convention shall form an integral part thereof and, unless otherwise expressly provided, a reference to the Convention constitutes at the same time a reference to any annexes thereto. Without prejudice to the provisions of Article 14, paragraphs 2(b) and 7, such annexes shall be restricted to lists, forms and any other material of a descriptive nature that is of a scientific, technical, procedural or administrative character.

2. Annexes to the Convention shall be proposed and adopted in accordance with the procedure set forth in Article 15, paragraphs 2, 3 and 4.

3. An annex that has been adopted in accordance with paragraph 2 above shall enter into force for all Parties to the Convention six months after the date of the communication by the Depositary to such Parties of the adoption of the annex, except for those Parties that have notified the Depositary, in writing, within that period of their non-acceptance of the annex. The annex shall enter into force for Parties which withdraw their notification of non-acceptance on the ninetieth day after the date on which withdrawal of such notification has been received by the Depositary

4 The proposal, adoption and entry into force of amendments to annexes to the Convention shall be subject to the same procedure as that for the proposal, adoption and entry into force of annexes to the Convention in accordance with paragraphs 2 and 3 above

5 If the adoption of an annex or an amendment to an annex involves an amendment to the Convention, that annex or amendment to an annex shall not enter into force until such time as the amendment to the Convention enters into force

ARTICLE 17

PROTOCOLS

1. The Conference of the Parties may, at any ordinary session, adopt protocols to the Convention.

2. The text of any proposed protocol shall be communicated to the Parties by the secretariat at least six months before such a session

3. The requirements for the entry into force of any protocol shall be established by that instrument.

4. Only Parties to the Convention may be Parties to a protocol.

5. Decisions under any protocol shall be taken only by the Parties to the protocol concerned.

ARTICLE 18

RIGHT TO VOTE

1. Each Party to the Convention shall have one vote, except as provided for in paragraph 2 below.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States that are Parties to the Convention. Such an organization shall not exercise its right to vote if any of its member States exercises its right, and vice versa.

ARTICLE 19

DEPOSITARY

The Secretary-General of the United Nations shall be the Depositary of the Convention and of protocols adopted in accordance with Article 17

ARTICLE 20

SIGNATURE

This Convention shall be open for signature by States Members of the United Nations or of any of its specialized agencies or that are Parties to the Statute of the International Court of Justice and by regional economic integration organizations at Rio de Janeiro, during the United Nations Conference on Environment and Development, and thereafter at United Nations Headquarters in New York from 20 June 1992 to 19 June 1993.

ARTICLE 21

INTERIM ARRANGEMENTS

1 The secretariat functions referred to in Article 8 will be carried out on an interim basis by the secretariat established by the General Assembly of the United Nations in its resolution 45/212 of 21 December 1990, until the completion of the first session of the Conference of the Parties.

2. The head of the interim secretariat referred to in paragraph 1 above will cooperate closely with the Intergovernmental Panel on Climate Change to ensure that the Panel can respond to the need for objective scientific and technical advice Other relevant scientific bodies could also be consulted

3 The Global Environment Facility of the United Nations Development Programme, the United Nations Environment Programme and the International Bank for Reconstruction and Development shall be the international entity entrusted with the operation of the financial mechanism referred to in Article 11 on an interim basis. In this connection, the Global Environment Facility should be appropriately restructured and its membership made universal to enable it to fulfil the requirements of Article 11

ARTICLE 22

RATIFICATION, ACCEPTANCE, APPROVAL OR ACCESSION

1. The Convention shall be subject to ratification, acceptance, approval or accession by States and by regional economic integration organizations. It shall be open for accession from the day after the date on which the Convention is closed for signature. Instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary

2. Any regional economic integration organization which becomes a Party to the Convention without any of its member States being a Party shall be bound by all the obligations under the Convention. In the case of such organizations, one or more of whose member States is a Party to the Convention, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under the Convention In such cases, the organization and the member States shall not be entitled to exercise rights under the Convention concurrently.

3. In their instruments of ratification, acceptance, approval or accession, regional economic integration organizations shall declare the extent of their competence with respect to the matters governed by the Convention These organizations shall also inform the Depositary, who shall in turn inform the Parties, of any substantial modification in the extent of their competence

ARTICLE 23

ENTRY INTO FORCE

1. The Convention shall enter into force on the ninetieth day after the date of deposit of the fiftieth instrument of ratification, acceptance, approval or accession

2. For each State or regional economic integration organization that ratifies, accepts or approves the Convention or accedes thereto after the deposit of the fiftieth instrument of ratification, acceptance, approval or accession, the Convention shall enter into force on the ninetieth day after the date of deposit by such State or regional economic integration organization of its instrument of ratification, acceptance, approval or accession

3 For the purposes of paragraphs 1 and 2 above, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by States members of the organization

ARTICLE 24

RESERVATIONS

No reservations may be made to the Convention.

ARTICLE 25

WITHDRAWAL

1 At any time after three years from the date on which the Convention has entered into force for a Party, that Party may withdraw from the Convention by giving written notification to the Depositary.

2 Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.

3 Any Party that withdraws from the Convention shall be considered as also having withdrawn from any protocol to which it is a Party.

ARTICLE 26

AUTHENTIC TEXTS

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations

IN WITNESS WHEREOF the undersigned, being duly authorized to that effect, have signed this Convention

DONE at New York this ninth day of May one thousand nine hundred and ninety-two

Annex I

Australia
Austria
Belarus[a/]
Belgium
Bulgaria[a/]
Canada
Czechoslovakia[a/]
Denmark
European Economic Community
Estonia[a/]
Finland
France
Germany
Greece
Hungary[a/]
Iceland
Ireland
Italy
Japan
Latvia[a/]
Lithuania[a/]
Luxembourg
Netherlands
New Zealand
Norway
Poland[a/]
Portugal
Romania[a/]
Russian Federation[a/]
Spain
Sweden
Switzerland
Turkey
Ukraine[a/]
United Kingdom of Great Britain and Northern Ireland
United States of America

---

a/ Countries that are undergoing the process of transition to a market economy

Annex II

Australia
Austria
Belgium
Canada
Denmark
European Economic Community
Finland
France
Germany
Greece
Iceland
Ireland
Italy
Japan
Luxembourg
Netherlands
New Zealand
Norway
Portugal
Spain
Sweden
Switzerland
Turkey
United Kingdom of Great Britain and Northern Ireland
United States of America

Convention on Biological Diversity

June 1992

CONVENTION ON BIOLOGICAL DIVERSITY

Preamble

The Contracting Parties,

Conscious of the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components,

Conscious also of the importance of biological diversity for evolution and for maintaining life sustaining systems of the biosphere,

Affirming that the conservation of biological diversity is a common concern of humankind,

Reaffirming that States have sovereign rights over their own biological resources,

Reaffirming also that States are responsible for conserving their biological diversity and for using their biological resources in a sustainable manner,

Concerned that biological diversity is being significantly reduced by certain human activities,

Aware of the general lack of information and knowledge regarding biological diversity and of the urgent need to develop scientific, technical and institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures,

Noting that it is vital to anticipate, prevent and attack the causes of significant reduction or loss of biological diversity at source,

Noting also that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat,

Noting further that the fundamental requirement for the conservation of biological diversity is the *in-situ* conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings,

Noting further that *ex-situ* measures, preferably in the country of origin, also have an important role to play,

Recognizing the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources, and the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of its components,

Recognizing also the vital role that women play in the conservation and sustainable use of biological diversity and affirming the need for the full participation of women at all levels of policy-making and implementation for biological diversity conservation,

/...

Stressing the importance of, and the need to promote, international, regional and global cooperation among States and intergovernmental organizations and the non-governmental sector for the conservation of biological diversity and the sustainable use of its components,

Acknowledging that the provision of new and additional financial resources and appropriate access to relevant technologies can be expected to make a substantial difference in the world's ability to address the loss of biological diversity,

Acknowledging further that special provision is required to meet the needs of developing countries, including the provision of new and additional financial resources and appropriate access to relevant technologies,

Noting in this regard the special conditions of the least developed countries and small island States,

Acknowledging that substantial investments are required to conserve biological diversity and that there is the expectation of a broad range of environmental, economic and social benefits from those investments,

Recognizing that economic and social development and poverty eradication are the first and overriding priorities of developing countries,

Aware that conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population, for which purpose access to and sharing of both genetic resources and technologies are essential,

Noting that, ultimately, the conservation and sustainable use of biological diversity will strengthen friendly relations among States and contribute to peace for humankind,

Desiring to enhance and complement existing international arrangements for the conservation of biological diversity and sustainable use of its components, and

Determined to conserve and sustainably use biological diversity for the benefit of present and future generations,

Have agreed as follows:

Article 1. Objectives

The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Article 2. Use of Terms

For the purposes of this Convention:

"*Biological diversity*" means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

"*Biological resources*" includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

"*Biotechnology*" means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

"*Country of origin of genetic resources*" means the country which possesses those genetic resources in *in-situ* conditions.

"*Country providing genetic resources*" means the country supplying genetic resources collected from *in-situ* sources, including populations of both wild and domesticated species, or taken from ex-situ sources, which may or may not have originated in that country.

"*Domesticated or cultivated species*" means species in which the evolutionary process has been influenced by humans to meet their needs.

"*Ecosystem*" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

"*Ex-situ conservation*" means the conservation of components of biological diversity outside their natural habitats.

"*Genetic material*" means any material of plant, animal, microbial or other origin containing functional units of heredity.

"*Genetic resources*" means genetic material of actual or potential value.

"*Habitat*" means the place or type of site where an organism or population naturally occurs.

"*In-situ conditions*" means conditions where genetic resources exist within ecosystems and natural habitats, and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.

"*In-situ conservation*" means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.

"*Protected area*" means a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives.

/...

"*Regional economic integration organization*" means an organization constituted by sovereign States of a given region, to which its member States have transferred competence in respect of matters governed by this Convention and which has been duly authorized, in accordance with its internal procedures, to sign, ratify, accept, approve or accede to it.

"*Sustainable use*" means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

"*Technology*" includes biotechnology.

Article 3. Principle

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Article 4. Jurisdictional Scope

Subject to the rights of other States, and except as otherwise expressly provided in this Convention, the provisions of this Convention apply, in relation to each Contracting Party:

(a) In the case of components of biological diversity, in areas within the limits of its national jurisdiction; and

(b) In the case of processes and activities, regardless of where their effects occur, carried out under its jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction.

Article 5. Cooperation

Each Contracting Party shall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or, where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity.

Article 6. General Measures for Conservation and Sustainable Use

Each Contracting Party shall, in accordance with its particular conditions and capabilities:

(a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, *inter alia*, the measures set out in this Convention relevant to the Contracting Party concerned; and

(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 7. Identification and Monitoring

Each Contracting Party shall, as far as possible and as appropriate, in particular for the purposes of Articles 8 to 10:

(a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I;

(b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;

(c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and

(d) Maintain and organize, by any mechanism data, derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above.

Article 8. In-situ Conservation

Each Contracting Party shall, as far as possible and as appropriate:

(a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;

(b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;

(c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use;

(d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;

(e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;

(f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, *inter alia*, through the development and implementation of plans or other management strategies;

(g) Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health;

(h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;

/...

(i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components;

(j) Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices;

(k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations;

(l) Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities; and

(m) Cooperate in providing financial and other support for *in-situ* conservation outlined in subparagraphs (a) to (l) above, particularly to developing countries.

Article 9. Ex-situ Conservation

Each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing *in-situ* measures:

(a) Adopt measures for the *ex-situ* conservation of components of biological diversity, preferably in the country of origin of such components;

(b) Establish and maintain facilities for *ex-situ* conservation of and research on plants, animals and micro-organisms, preferably in the country of origin of genetic resources;

(c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;

(d) Regulate and manage collection of biological resources from natural habitats for *ex-situ* conservation purposes so as not to threaten ecosystems and *in-situ* populations of species, except where special temporary *ex-situ* measures are required under subparagraph (c) above; and

(e) Cooperate in providing financial and other support for *ex-situ* conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of *ex-situ* conservation facilities in developing countries.

Article 10. Sustainable Use of Components of Biological Diversity

Each Contracting Party shall, as far as possible and as appropriate:

(a) Integrate consideration of the conservation and sustainable use of biological resources into national decision-making;

(b) Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity;

/...

(c) Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements;

(d) Support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced; and

(e) Encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources.

Article 11. Incentive Measures

Each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity.

Article 12. Research and Training

The Contracting Parties, taking into account the special needs of developing countries, shall:

(a) Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such education and training for the specific needs of developing countries;

(b) Promote and encourage research which contributes to the conservation and sustainable use of biological diversity, particularly in developing countries, *inter alia*, in accordance with decisions of the Conference of the Parties taken in consequence of recommendations of the Subsidiary Body on Scientific, Technical and Technological Advice; and

(c) In keeping with the provisions of Articles 16, 18 and 20, promote and cooperate in the use of scientific advances in biological diversity research in developing methods for conservation and sustainable use of biological resources.

Article 13. Public Education and Awareness

The Contracting Parties shall:

(a) Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and

(b) Cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity.

Article 14. Impact Assessment and Minimizing Adverse Impacts

1. Each Contracting Party, as far as possible and as appropriate, shall:

(a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant

/...

adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;

(b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account;

(c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate;

(d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and

(e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic integration organizations concerned, to establish joint contingency plans.

2. The Conference of the Parties shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.

Article 15. Access to Genetic Resources

1. Recognizing the sovereign rights of States over their natural resources, the authority to determine access to genetic resources rests with the national governments and is subject to national legislation.

2. Each Contracting Party shall endeavour to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention.

3. For the purpose of this Convention, the genetic resources being provided by a Contracting Party, as referred to in this Article and Articles 16 and 19, are only those that are provided by Contracting Parties that are countries of origin of such resources or by the Parties that have acquired the genetic resources in accordance with this Convention.

4. Access, where granted, shall be on mutually agreed terms and subject to the provisions of this Article.

5. Access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.

6. Each Contracting Party shall endeavour to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in, such Contracting Parties.

7. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, and in accordance with Articles 16 and 19 and, where necessary, through the financial mechanism established by Articles 20 and 21 with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.

Article 16. Access to and Transfer of Technology

1. Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.

2. Access to and transfer of technology referred to in paragraph 1 above to developing countries shall be provided and/or facilitated under fair and most favourable terms, including on concessional and preferential terms where mutually agreed, and, where necessary, in accordance with the financial mechanism established by Articles 20 and 21. In the case of technology subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights. The application of this paragraph shall be consistent with paragraphs 3, 4 and 5 below.

3. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that Contracting Parties, in particular those that are developing countries, which provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other intellectual property rights, where necessary, through the provisions of Articles 20 and 21 and in accordance with international law and consistent with paragraphs 4 and 5 below.

4. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that the private sector facilitates access to, joint development and transfer of technology referred to in paragraph 1 above for the benefit of both governmental institutions and the private sector of developing countries and in this regard shall abide by the obligations included in paragraphs 1, 2 and 3 above.

5. The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.

Article 17. Exchange of Information

1. The Contracting Parties shall facilitate the exchange of information, from all publicly available sources, relevant to the conservation and sustainable use of biological diversity, taking into account the special needs of developing countries.

2. Such exchange of information shall include exchange of results of technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge as such and in combination with the technologies referred to in Article 16, paragraph 1. It shall also, where feasible, include repatriation of information.

Article 18. Technical and Scientific Cooperation

1. The Contracting Parties shall promote international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity, where necessary, through the appropriate international and national institutions.

2. Each Contracting Party shall promote technical and scientific cooperation with other Contracting Parties, in particular developing countries, in implementing this Convention, *inter alia*, through the development and implementation of national policies. In promoting such cooperation, special attention should be given to the development and strengthening of national capabilities, by means of human resources development and institution building.

3. The Conference of the Parties, at its first meeting, shall determine how to establish a clearing-house mechanism to promote and facilitate technical and scientific cooperation.

4. The Contracting Parties shall, in accordance with national legislation and policies, encourage and develop methods of cooperation for the development and use of technologies, including indigenous and traditional technologies, in pursuance of the objectives of this Convention. For this purpose, the Contracting Parties shall also promote cooperation in the training of personnel and exchange of experts.

5. The Contracting Parties shall, subject to mutual agreement, promote the establishment of joint research programmes and joint ventures for the development of technologies relevant to the objectives of this Convention.

Article 19. Handling of Biotechnology and Distribution of its Benefits

1. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, to provide for the effective participation in biotechnological research activities by those Contracting Parties, especially developing countries, which provide the genetic resources for such research, and where feasible in such Contracting Parties.

2. Each Contracting Party shall take all practicable measures to promote and advance priority access on a fair and equitable basis by Contracting Parties, especially developing countries, to the results and benefits arising from biotechnologies based upon genetic resources provided by those Contracting Parties. Such access shall be on mutually agreed terms.

/...

3. The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures, including, in particular, advance informed agreement, in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity.

4. Each Contracting Party shall, directly or by requiring any natural or legal person under its jurisdiction providing the organisms referred to in paragraph 3 above, provide any available information about the use and safety regulations required by that Contracting Party in handling such organisms, as well as any available information on the potential adverse impact of the specific organisms concerned to the Contracting Party into which those organisms are to be introduced.

Article 20. Financial Resources

1. Each Contracting Party undertakes to provide, in accordance with its capabilities, financial support and incentives in respect of those national activities which are intended to achieve the objectives of this Convention, in accordance with its national plans, priorities and programmes.

2. The developed country Parties shall provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations of this Convention and to benefit from its provisions and which costs are agreed between a developing country Party and the institutional structure referred to in Article 21, in accordance with policy, strategy, programme priorities and eligibility criteria and an indicative list of incremental costs established by the Conference of the Parties. Other Parties, including countries undergoing the process of transition to a market economy, may voluntarily assume the obligations of the developed country Parties. For the purpose of this Article, the Conference of the Parties, shall at its first meeting establish a list of developed country Parties and other Parties which voluntarily assume the obligations of the developed country Parties. The Conference of the Parties shall periodically review and if necessary amend the list. Contributions from other countries and sources on a voluntary basis would also be encouraged. The implementation of these commitments shall take into account the need for adequacy, predictability and timely flow of funds and the importance of burden-sharing among the contributing Parties included in the list.

3. The developed country Parties may also provide, and developing country Parties avail themselves of, financial resources related to the implementation of this Convention through bilateral, regional and other multilateral channels.

4. The extent to which developing country Parties will effectively implement their commitments under this Convention will depend on the effective implementation by developed country Parties of their commitments under this Convention related to financial resources and transfer of technology and will take fully into account the fact that economic and social development and eradication of poverty are the first and overriding priorities of the developing country Parties.

5. The Parties shall take full account of the specific needs and special situation of least developed countries in their actions with regard to funding and transfer of technology.

6. The Contracting Parties shall also take into consideration the special conditions resulting from the dependence on, distribution and location of, biological diversity within developing country Parties, in particular small island States.

7. Consideration shall also be given to the special situation of developing countries, including those that are most environmentally vulnerable, such as those with arid and semi-arid zones, coastal and mountainous areas.

Article 21. Financial Mechanism

1. There shall be a mechanism for the provision of financial resources to developing country Parties for purposes of this Convention on a grant or concessional basis the essential elements of which are described in this Article. The mechanism shall function under the authority and guidance of, and be accountable to, the Conference of the Parties for purposes of this Convention. The operations of the mechanism shall be carried out by such institutional structure as may be decided upon by the Conference of the Parties at its first meeting. For purposes of this Convention, the Conference of the Parties shall determine the policy, strategy, programme priorities and eligibility criteria relating to the access to and utilization of such resources. The contributions shall be such as to take into account the need for predictability, adequacy and timely flow of funds referred to in Article 20 in accordance with the amount of resources needed to be decided periodically by the Conference of the Parties and the importance of burden-sharing among the contributing Parties included in the list referred to in Article 20, paragraph 2. Voluntary contributions may also be made by the developed country Parties and by other countries and sources. The mechanism shall operate within a democratic and transparent system of governance.

2. Pursuant to the objectives of this Convention, the Conference of the Parties shall at its first meeting determine the policy, strategy and programme priorities, as well as detailed criteria and guidelines for eligibility for access to and utilization of the financial resources including monitoring and evaluation on a regular basis of such utilization. The Conference of the Parties shall decide on the arrangements to give effect to paragraph 1 above after consultation with the institutional structure entrusted with the operation of the financial mechanism.

3. The Conference of the Parties shall review the effectiveness of the mechanism established under this Article, including the criteria and guidelines referred to in paragraph 2 above, not less than two years after the entry into force of this Convention and thereafter on a regular basis. Based on such review, it shall take appropriate action to improve the effectiveness of the mechanism if necessary.

4. The Contracting Parties shall consider strengthening existing financial institutions to provide financial resources for the conservation and sustainable use of biological diversity.

Article 22. Relationship with Other International Conventions

1. The provisions of this Convention shall not affect the rights and obligations of any Contracting Party deriving from any existing international agreement, except where the exercise of those rights and obligations would cause a serious damage or threat to biological diversity.

2. Contracting Parties shall implement this Convention with respect to the marine environment consistently with the rights and obligations of States under the law of the sea.

Article 23. Conference of the Parties

1. A Conference of the Parties is hereby established. The first meeting of the Conference of the Parties shall be convened by the Executive Director of the United Nations Environment Programme not later than one year after the entry into force of this Convention. Thereafter, ordinary meetings of the Conference of the Parties shall be held at regular intervals to be determined by the Conference at its first meeting.

2. Extraordinary meetings of the Conference of the Parties shall be held at such other times as may be deemed necessary by the Conference, or at the written request of any Party, provided that, within six months of the request being communicated to them by the Secretariat, it is supported by at least one third of the Parties.

3. The Conference of the Parties shall by consensus agree upon and adopt rules of procedure for itself and for any subsidiary body it may establish, as well as financial rules governing the funding of the Secretariat. At each ordinary meeting, it shall adopt a budget for the financial period until the next ordinary meeting.

4. The Conference of the Parties shall keep under review the implementation of this Convention, and, for this purpose, shall:

(a) Establish the form and the intervals for transmitting the information to be submitted in accordance with Article 26 and consider such information as well as reports submitted by any subsidiary body;

(b) Review scientific, technical and technological advice on biological diversity provided in accordance with Article 25;

(c) Consider and adopt, as required, protocols in accordance with Article 28;

(d) Consider and adopt, as required, in accordance with Articles 29 and 30, amendments to this Convention and its annexes;

(e) Consider amendments to any protocol, as well as to any annexes thereto, and, if so decided, recommend their adoption to the parties to the protocol concerned;

(f) Consider and adopt, as required, in accordance with Article 30, additional annexes to this Convention;

(g) Establish such subsidiary bodies, particularly to provide scientific and technical advice, as are deemed necessary for the implementation of this Convention;

(h) Contact, through the Secretariat, the executive bodies of conventions dealing with matters covered by this Convention with a view to establishing appropriate forms of cooperation with them; and

/...

(i) Consider and undertake any additional action that may be required for the achievement of the purposes of this Convention in the light of experience gained in its operation.

5. The United Nations, its specialized agencies and the International Atomic Energy Agency, as well as any State not Party to this Convention, may be represented as observers at meetings of the Conference of the Parties. Any other body or agency, whether governmental or non-governmental, qualified in fields relating to conservation and sustainable use of biological diversity, which has informed the Secretariat of its wish to be represented as an observer at a meeting of the Conference of the Parties, may be admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure adopted by the Conference of the Parties.

Article 24. Secretariat

1. A secretariat is hereby established. Its functions shall be:

(a) To arrange for and service meetings of the Conference of the Parties provided for in Article 23;

(b) To perform the functions assigned to it by any protocol;

(c) To prepare reports on the execution of its functions under this Convention and present them to the Conference of the Parties;

(d) To coordinate with other relevant international bodies and, in particular to enter into such administrative and contractual arrangements as may be required for the effective discharge of its functions; and

(e) To perform such other functions as may be determined by the Conference of the Parties.

2. At its first ordinary meeting, the Conference of the Parties shall designate the secretariat from amongst those existing competent international organizations which have signified their willingness to carry out the secretariat functions under this Convention.

Article 25. Subsidiary Body on Scientific, Technical and Technological Advice

1. A subsidiary body for the provision of scientific, technical and technological advice is hereby established to provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely advice relating to the implementation of this Convention. This body shall be open to participation by all Parties and shall be multidisciplinary. It shall comprise government representatives competent in the relevant field of expertise. It shall report regularly to the Conference of the Parties on all aspects of its work.

2. Under the authority of and in accordance with guidelines laid down by the Conference of the Parties, and upon its request, this body shall:

(a) Provide scientific and technical assessments of the status of biological diversity;

(b) Prepare scientific and technical assessments of the effects of types of measures taken in accordance with the provisions of this Convention;

(c) Identify innovative, efficient and state-of-the-art technologies and know-how relating to the conservation and sustainable use of biological diversity and advise on the ways and means of promoting development and/or transferring such technologies;

(d) Provide advice on scientific programmes and international cooperation in research and development related to conservation and sustainable use of biological diversity; and

(e) Respond to scientific, technical, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.

3. The functions, terms of reference, organization and operation of this body may be further elaborated by the Conference of the Parties.

Article 26. Reports

Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, reports on measures which it has taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention.

Article 27. Settlement of Disputes

1. In the event of a dispute between Contracting Parties concerning the interpretation or application of this Convention, the parties concerned shall seek solution by negotiation.

2. If the parties concerned cannot reach agreement by negotiation, they may jointly seek the good offices of, or request mediation by, a third party.

3. When ratifying, accepting, approving or acceding to this Convention, or at any time thereafter, a State or regional economic integration organization may declare in writing to the Depositary that for a dispute not resolved in accordance with paragraph 1 or paragraph 2 above, it accepts one or both of the following means of dispute settlement as compulsory:

(a) Arbitration in accordance with the procedure laid down in Part 1 of Annex II;

(b) Submission of the dispute to the International Court of Justice.

4. If the parties to the dispute have not, in accordance with paragraph 3 above, accepted the same or any procedure, the dispute shall be submitted to conciliation in accordance with Part 2 of Annex II unless the parties otherwise agree.

5. The provisions of this Article shall apply with respect to any protocol except as otherwise provided in the protocol concerned.

/...

Article 28. Adoption of Protocols

1. The Contracting Parties shall cooperate in the formulation and adoption of protocols to this Convention.

2. Protocols shall be adopted at a meeting of the Conference of the Parties.

3. The text of any proposed protocol shall be communicated to the Contracting Parties by the Secretariat at least six months before such a meeting.

Article 29. Amendment of the Convention or Protocols

1. Amendments to this Convention may be proposed by any Contracting Party. Amendments to any protocol may be proposed by any Party to that protocol.

2. Amendments to this Convention shall be adopted at a meeting of the Conference of the Parties. Amendments to any protocol shall be adopted at a meeting of the Parties to the Protocol in question. The text of any proposed amendment to this Convention or to any protocol, except as may otherwise be provided in such protocol, shall be communicated to the Parties to the instrument in question by the secretariat at least six months before the meeting at which it is proposed for adoption. The secretariat shall also communicate proposed amendments to the signatories to this Convention for information.

3. The Parties shall make every effort to reach agreement on any proposed amendment to this Convention or to any protocol by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the amendment shall as a last resort be adopted by a two-third majority vote of the Parties to the instrument in question present and voting at the meeting, and shall be submitted by the Depositary to all Parties for ratification, acceptance or approval.

4. Ratification, acceptance or approval of amendments shall be notified to the Depositary in writing. Amendments adopted in accordance with paragraph 3 above shall enter into force among Parties having accepted them on the ninetieth day after the deposit of instruments of ratification, acceptance or approval by at least two thirds of the Contracting Parties to this Convention or of the Parties to the protocol concerned, except as may otherwise be provided in such protocol. Thereafter the amendments shall enter into force for any other Party on the ninetieth day after that Party deposits its instrument of ratification, acceptance or approval of the amendments.

5. For the purposes of this Article, "Parties present and voting" means Parties present and casting an affirmative or negative vote.

Article 30. Adoption and Amendment of Annexes

1. The annexes to this Convention or to any protocol shall form an integral part of the Convention or of such protocol, as the case may be, and, unless expressly provided otherwise, a reference to this Convention or its protocols constitutes at the same time a reference to any annexes thereto. Such annexes shall be restricted to procedural, scientific, technical and administrative matters.

/...

2. Except as may be otherwise provided in any protocol with respect to its annexes, the following procedure shall apply to the proposal, adoption and entry into force of additional annexes to this Convention or of annexes to any protocol:

(a) Annexes to this Convention or to any protocol shall be proposed and adopted according to the procedure laid down in Article 29;

(b) Any Party that is unable to approve an additional annex to this Convention or an annex to any protocol to which it is Party shall so notify the Depositary, in writing, within one year from the date of the communication of the adoption by the Depositary. The Depositary shall without delay notify all Parties of any such notification received. A Party may at any time withdraw a previous declaration of objection and the annexes shall thereupon enter into force for that Party subject to subparagraph (c) below;

(c) On the expiry of one year from the date of the communication of the adoption by the Depositary, the annex shall enter into force for all Parties to this Convention or to any protocol concerned which have not submitted a notification in accordance with the provisions of subparagraph (b) above.

3. The proposal, adoption and entry into force of amendments to annexes to this Convention or to any protocol shall be subject to the same procedure as for the proposal, adoption and entry into force of annexes to the Convention or annexes to any protocol.

4. If an additional annex or an amendment to an annex is related to an amendment to this Convention or to any protocol, the additional annex or amendment shall not enter into force until such time as the amendment to the Convention or to the protocol concerned enters into force.

Article 31. Right to Vote

1. Except as provided for in paragraph 2 below, each Contracting Party to this Convention or to any protocol shall have one vote.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States which are Contracting Parties to this Convention or the relevant protocol. Such organizations shall not exercise their right to vote if their member States exercise theirs, and vice versa.

Article 32. Relationship between this Convention and Its Protocols

1. A State or a regional economic integration organization may not become a Party to a protocol unless it is, or becomes at the same time, a Contracting Party to this Convention.

2. Decisions under any protocol shall be taken only by the Parties to the protocol concerned. Any Contracting Party that has not ratified, accepted or approved a protocol may participate as an observer in any meeting of the Parties to that protocol.

/...

Article 33. Signature

This Convention shall be open for signature at Rio de Janeiro by all States and any regional economic integration organization from 5 June 1992 until 14 June 1992, and at the United Nations Headquarters in New York from 15 June 1992 to 4 June 1993.

Article 34. Ratification, Acceptance or Approval

1. This Convention and any protocol shall be subject to ratification, acceptance or approval by States and by regional economic integration organizations. Instruments of ratification, acceptance or approval shall be deposited with the Depositary.

2. Any organization referred to in paragraph 1 above which becomes a Contracting Party to this Convention or any protocol without any of its membe States being a Contracting Party shall be bound by all the obligations under the Convention or the protocol, as the case may be. In the case of such organizations, one or more of whose member States is a Contracting Party to this Convention or relevant protocol, the organization and its member States shall decide on their respective responsibilities for the performance of thei obligations under the Convention or protocol, as the case may be. In such cases, the organization and the member States shall not be entitled to exercise rights under the Convention or relevant protocol concurrently.

3. In their instruments of ratification, acceptance or approval, the organizations referred to in paragraph 1 above shall declare the extent of their competence with respect to the matters governed by the Convention or the relevant protocol. These organizations shall also inform the Depositary of any relevant modification in the extent of their competence.

Article 35. Accession

1. This Convention and any protocol shall be open for accession by States and by regional economic integration organizations from the date on which the Convention or the protocol concerned is closed for signature. The instrument of accession shall be deposited with the Depositary.

2. In their instruments of accession, the organizations referred to in paragraph 1 above shall declare the extent of their competence with respect the matters governed by the Convention or the relevant protocol. These organizations shall also inform the Depositary of any relevant modification the extent of their competence.

3. The provisions of Article 34, paragraph 2, shall apply to regional economic integration organizations which accede to this Convention or any protocol.

Article 36. Entry Into Force

1. This Convention shall enter into force on the ninetieth day after the date of deposit of the thirtieth instrument of ratification, acceptance, approval or accession.

2. Any protocol shall enter into force on the ninetieth day after the date of deposit of the number of instruments of ratification, acceptance, approval or accession, specified in that protocol, has been deposited.

/...

3. For each Contracting Party which ratifies, accepts or approves this Convention or accedes thereto after the deposit of the thirtieth instrument of ratification, acceptance, approval or accession, it shall enter into force on the ninetieth day after the date of deposit by such Contracting Party of its instrument of ratification, acceptance, approval or accession.

4. Any protocol, except as otherwise provided in such protocol, shall enter into force for a Contracting Party that ratifies, accepts or approves that protocol or accedes thereto after its entry into force pursuant to paragraph 2 above, on the ninetieth day after the date on which that Contracting Party deposits its instrument of ratification, acceptance, approval or accession, or on the date on which this Convention enters into force for that Contracting Party, whichever shall be the later.

5. For the purposes of paragraphs 1 and 2 above, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by member States of such organization.

Article 37. Reservations

No reservations may be made to this Convention.

Article 38. Withdrawals

1. At any time after two years from the date on which this Convention has entered into force for a Contracting Party, that Contracting Party may withdraw from the Convention by giving written notification to the Depositary.

2. Any such withdrawal shall take place upon expiry of one year after the date of its receipt by the Depositary, or on such later date as may be specified in the notification of the withdrawal.

3. Any Contracting Party which withdraws from this Convention shall be considered as also having withdrawn from any protocol to which it is party.

Article 39. Financial Interim Arrangements

Provided that it has been fully restructured in accordance with the requirements of Article 21, the Global Environment Facility of the United Nations Development Programme, the United Nations Environment Programme and the International Bank for Reconstruction and Development shall be the institutional structure referred to in Article 21 on an interim basis, for the period between the entry into force of this Convention and the first meeting of the Conference of the Parties or until the Conference of the Parties decides which institutional structure will be designated in accordance with Article 21.

Article 40. Secretariat Interim Arrangements

The secretariat to be provided by the Executive Director of the United Nations Environment Programme shall be the secretariat referred to in Article 24, paragraph 2, on an interim basis for the period between the entry into force of this Convention and the first meeting of the Conference of the Parties.

Article 41. Depositary

The Secretary-General of the United Nations shall assume the functions of Depositary of this Convention and any protocols.

Article 42. Authentic Texts

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

IN WITNESS WHEREOF the undersigned, being duly authorized to that effect, have signed this Convention.

Done at Rio de Janeiro on this fifth day of June, one thousand nine hundred and ninety-two.

Annex I

IDENTIFICATION AND MONITORING

1. Ecosystems and habitats: containing high diversity, large numbers of endemic or threatened species, or wilderness; required by migratory species; of social, economic, cultural or scientific importance; or, which are representative, unique or associated with key evolutionary or other biological processes;

2. Species and communities which are: threatened; wild relatives of domesticated or cultivated species; of medicinal, agricultural or other economic value; or social, scientific or cultural importance; or importance for research into the conservation and sustainable use of biological diversity, such as indicator species; and

3. Described genomes and genes of social, scientific or economic importance.

Annex II

Part 1

ARBITRATION

Article 1

The claimant party shall notify the secretariat that the parties are referring a dispute to arbitration pursuant to Article 27. The notification shall state the subject-matter of arbitration and include, in particular, the articles of the Convention or the protocol, the interpretation or application of which are at issue. If the parties do not agree on the subject matter of the dispute before the President of the tribunal is designated, the arbitral tribunal shall determine the subject matter. The secretariat shall forward the information thus received to all Contracting Parties to this Convention c to the protocol concerned.

Article 2

1. In disputes between two parties, the arbitral tribunal shall consist of three members. Each of the parties to the dispute shall appoint an arbitrato and the two arbitrators so appointed shall designate by common agreement the third arbitrator who shall be the President of the tribunal. The latter sl not be a national of one of the parties to the dispute, nor have his or her usual place of residence in the territory of one of these parties, nor be employed by any of them, nor have dealt with the case in any other capacity.

2. In disputes between more than two parties, parties in the same interest shall appoint one arbitrator jointly by agreement.

3. Any vacancy shall be filled in the manner prescribed for the initial appointment.

Article 3

1. If the President of the arbitral tribunal has not been designated within two months of the appointment of the second arbitrator, the Secretary-General of the United Nations shall, at the request of a party, designate the President within a further two-month period.

2. If one of the parties to the dispute does not appoint an arbitrator within two months of receipt of the request, the other party may inform the Secretary-General who shall make the designation within a further two-month period.

Article 4

The arbitral tribunal shall render its decisions in accordance with the provisions of this Convention, any protocols concerned, and international law

Article 5

Unless the parties to the dispute otherwise agree, the arbitral tribunal shall determine its own rules of procedure.

/...

Article 6

The arbitral tribunal may, at the request of one of the parties, recommend essential interim measures of protection.

Article 7

The parties to the dispute shall facilitate the work of the arbitral tribunal and, in particular, using all means at their disposal, shall:

(a) Provide it with all relevant documents, information and facilities; and

(b) Enable it, when necessary, to call witnesses or experts and receive their evidence.

Article 8

The parties and the arbitrators are under an obligation to protect the confidentiality of any information they receive in confidence during the proceedings of the arbitral tribunal.

Article 9

Unless the arbitral tribunal determines otherwise because of the particular circumstances of the case, the costs of the tribunal shall be borne by the parties to the dispute in equal shares. The tribunal shall keep a record of all its costs, and shall furnish a final statement thereof to the parties.

Article 10

Any Contracting Party that has an interest of a legal nature in the subject-matter of the dispute which may be affected by the decision in the case, may intervene in the proceedings with the consent of the tribunal.

Article 11

The tribunal may hear and determine counterclaims arising directly out of the subject-matter of the dispute.

Article 12

Decisions both on procedure and substance of the arbitral tribunal shall be taken by a majority vote of its members.

Article 13

If one of the parties to the dispute does not appear before the arbitral tribunal or fails to defend its case, the other party may request the tribunal to continue the proceedings and to make its award. Absence of a party or a failure of a party to defend its case shall not constitute a bar to the proceedings. Before rendering its final decision, the arbitral tribunal must satisfy itself that the claim is well founded in fact and law.

Article 5

The conciliation commission shall take its decisions by majority vote of its members. It shall, unless the parties to the dispute otherwise agree, determine its own procedure. It shall render a proposal for resolution of the dispute, which the parties shall consider in good faith.

Article 6

A disagreement as to whether the conciliation commission has competence shall be decided by the commission.

Global Environmental Facility

Chandra Sekhar Sinha

The Global Environment Facility[1]

1. Background

The United Nations Framework Convention on Climate Change (UNFCCC), signed by 154 heads of State and governments, and the Convention on Biological Diversity (CBD) were the among the two important outcomes of the Earth Summit in Rio de Janeiro, Brazil in June 1992. Following their ratification the CBD and UNFCCC became a legally binding convention to its signatories (UNFCCC on 21 March 1994 and the CBD on 29th December 1993).

Like other developing countries, India was emphatic during the negotiations leading to the convention in placing responsibility and pushing for reciprocal commitments - new and additional financial resources and required technology transfer to be provided by the developed countries for emissions reductions or sink enhancements or protection of biological diversity by the developing countries.

The commitments of the Parties to the convention does distinguish between countries with respect to the measures to be taken, financing of the measures and for the relevant technology transfer. New and additional financial resources were to be made available to meet the agreed full incremental costs of implementation of measures in both the conventions.

The following extracts from *Article 4* (Commitments) of the UNFCCC is illustrative of the agreement reached in both the conventions.

Para 1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

(a) develop, periodically update, publish and make available to the Conference of Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of Parties;

(b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaption to climate change;...

(f) Take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example impact assessments, formulated and determined nationally, with a view of minimizing adverse effect on the economy, on public health and on the quality of the environment, of projects and measures undertaken by them to mitigate or adapt to climate change;

Para 3. The developed country Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country parties to meet the agreed full incremental cost of implementing measures that are covered by paragraph 1 of this Article and that are agreed between a developing country Party and the international entity or entities referred to in Article 11, ...

Para 5. The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to

---

1. Background material for the presentation of Chandra Shekhar Sinha on the *Global Environment facility.*

The Global Environment Facility[1]

1. Background

The United Nations Framework Convention on Climate Change (UNFCCC), signed by 154 heads of State and governments, and the Convention on Biological Diversity (CBD) were the among the two important outcomes of the Earth Summit in Rio de Janeiro, Brazil in June 1992. Following their ratification the CBD and UNFCCC became a legally binding convention to its signatories (UNFCCC on 21 March 1994 and the CBD on 29th December 1993).

Like other developing countries, India was emphatic during the negotiations leading to the convention in placing responsibility and pushing for reciprocal commitments - new and additional financial resources and required technology transfer to be provided by the developed countries for emissions reductions or sink enhancements or protection of biological diversity by the developing countries.

The commitments of the Parties to the convention does distinguish between countries with respect to the measures to be taken, financing of the measures and for the relevant technology transfer. New and additional financial resources were to be made available to meet the agreed full incremental costs of implementation of measures in both the conventions.

The following extracts from *Article 4* (Commitments) of the UNFCCC is illustrative of the agreement reached in both the conventions.

Para 1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

- (a) develop, periodically update, publish and make available to the Conference of Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of Parties;
- (b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaption to climate change;...
- (f) Take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example impact assessments, formulated and determined nationally, with a view of minimizing adverse effect on the economy, on public health and on the quality of the environment, of projects and measures undertaken by them to mitigate or adapt to climate change;

Para 3. The developed country Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country parties to meet the agreed full incremental cost of implementing measures that are covered by paragraph 1 of this Article and that are agreed between a developing country Party and the international entity or entities referred to in Article 11, ...

Para 5. The developed country Parties and other developed Parties included in Annex II shall take all practicable

---

1. Background material for the presentation of Chandra Shekhar Sinha on the *Global Environment facility*.

steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country parties....

Global Environmental Facility as the interim arrangement for implementing the financial mechanism of the convention.

1.2 Financing Mechanism and the Global Environment Facility

Article 21, paragraph 3 of the UNFCCC established the GEF (Global Environment Facility) is the 'international entity' referred to in Article 4(3) and Article 11. It is also the interim funding mechanism for the UN Conventions on Biological Diversity, in addition to the UNFCCC, until those party to the Conventions agree on a permanent arrangement. The GEF was established in 1991 by the World Bank, UNDP and UNEP as a pilot programme to provide new and additional funding for protection of the global environment in four areas - climate change, biological diversity, international waters and ozone depletion. Activities to redress land degradation - primarily decertification and deforestation - as it relates to the four focal areas, are also eligible for GEF support.

Although there are many areas where the three implementing agencies (UNEP, UNDP and the World Bank) are expected to collaborate, each of the three also has distinctive areas of emphasis.[2]

UNEP (United Nations Environment Programme)
UNEP will play the primary role in catalyzing the development of scientific and technical analysis and in advancing environmental management in GEF-financed activities. UNEP will also provide guidance on relating GEF-financed activities to global, regional and national environmental assessments, policy frameworks and plans, and to international agreements. It will also be responsible for establishing and supporting the Scientific and Technical Advisory Panel (STAP) as an advisory body to the GEF.

UNDP (United nations Development Programme)
UNDP will play the primary role in ensuring the development and management of capacity building programs and technical assistance projects. Through its global network of field offices, UNDP will draw upon its experience in human resources development, institutional strengthening, and non-governmental and community participation to assist countries in promoting, designing and implementing activities consistent with the purpose of the GEF and national sustainable development strategies. Also drawing on its intercountry programming experience, UNDP will contribute to the development of regional and global projects within the GEF work program in cooperation with the other Implementing Agencies.

The World Bank

---

2. See Annex D, paragraph 11 of the *Instrument for the Establishment of the Restructured Global Environment Facility.*

The World Bank, the GEF Trust Fund's repository, will play the primary role in ensuring the development and management of investment projects while also mobilizing private sector resources that are consistent with GEF objectives and national sustainable development strategies.

The restructured GEF

In 1992, GEF participants had agreed to restructure the GEF based on the principles of transparency, accountability to contributors and beneficiaries alike, universal participation, cost- effectiveness of activities and building on proven institutional structures, as well as country-driven programmes and projects.

The representatives of States participating in the GEF held a series of meetings from late 1992 to March 1994 to draw up the text of the agreement for a restructured GEF (or GEF II). Negotiations were stalled on a funding target, the allocation of seats on GEF's Council and the method of choosing the Council's Chairman. When the participants met in Geneva from 14 to 16 March, 1994, agreement was reached on the Instrument for the Restructured Facility. The participants also agreed to commit $2 billion in new funding for GEF for a three-year period beginning June 1994, with the US pledging $430 million and Japan $400 million.

The year-long restructuring process fundamentally altered the GEF's institutional arrangements, creating a new level of accountability to the participating Governments, establishing new requirements for public information disclosure, and putting in place a more democratic decision-making process. The GEF's governance now has three main organs: the Assembly, the Council, and the Secretariat.

Assembly

In the new agreement, an Assembly, with universal representation, will meet every three years to review and evaluate general policies, operations and membership, and approve amendments. The relevant paragraphs from the

13. The Assembly shall consist of Representatives of all Participants. The Assembly shall meet once every three years. Each Participant may appoint one Representative and one Alternate to the Assembly in such manner as it may determine. Each Representative and each Alternate shall serve until replaced. The Assembly shall elect its Chairperson from among the Representatives.

14. The Assembly shall:
    (a) Review the general policies of the Facility;
    (b) Review and evaluate the operation of the Facility on the basis of reports submitted by the Council;
    (c) Keep under review the membership of the Facility; and
    (d) Consider, for approval by consensus, amendments to the present Instrument on the basis of recommendation by the Council.

Council[3]

The 32-nation Council is the GEF's main governing body. It will meet every six months, with additional meetings if needed. Generally, decisions in the Assembly and Council will be taken by consensus; where a formal vote is required, a double majority system will apply.[4] Under the restructured GEF, 18 of the Council's 32 seats will go to developing countries, 14 to industrialized nations and two to countries of economies in transition from Eastern Europe. The *Instrument* groups the constituencies as follows:

1. GEF participants shall be grouped in 32 constituencies, with 18 constituencies composed of recipient countries (referred to as "recipient constituencies)" and 14 constituencies composed principally of non-recipient countries (referred to as "non-recipient constituencies").
2. The 18 recipient constituencies shall be distributed among the following geographic regions, bearing in mind the possibility of mixed constituencies:

Africa	6
Asia and Pacific	6
Latin America and Caribbean	4
Central, Eastern Europe and Former Soviet Union	2

The Council will be chaired jointly by the GEF's chief executive officer and a chairperson elected from Council members. The chief executive officer will run the GEF on a day-to-day basis. The elected chair will preside on matters of accountability including the performance of the CEO and the Secretariat, as well as broad policy matters.

Secretariat

The Secretariat will service and report to the Council and the Assembly. Its responsibilities will include ensuring the effective implementation of the decisions of the Assembly and the Council; coordinating the formulation and overseeing the implementation of the GEF work programme; and ensuring that the operational policies adopted by the Council are implemented.

---

3. See Annex E 11 of the *Instrument for the Establishment of the Restructured Global Environment Facility.*

4. This implies that an affirmative vote requires both a 60 percent majority of the total number of Participants and a 60 percent majority of the total contributions (Paragraph 25[c(i)]). For the purpose of voting power, total contributions shall consist of the actual cumulative contributions made to the GEF Trust Fund as specified in Annex C (Attachment 1) of the *Instrument* and reproduced as Table ?? and in subsequent replenishment of the GEF Trust Fund, contributions made to the GET, and the grant equivalent of co-financing and parallel financing made under the GEF pilot program, or agreed with the Trustee, until the effective date of the GEF Trust Fund. Until the effective date of the GEF Trust Fund, advance contributions made under paragraph 7(c) of Annex C of the *Instrument*, shall be deemed to be contributions to the GET (Paragraph 25[c(iii)]).

GEF Financing of projects and work programme

Ongoing GEF projects in India

In the pilot phase of the GEF, three projects were approved. All the three projects were in the renewable energy sector. In addition, a project for biomass cogeneration and clean coal technologies was approved for USA Parallel Co-financing through the USAID. The ongoing implementation projects in India are summarised below:

Project	Implementing agency	Executing agency	Duration (years)	Total cost (million $)	GEF share of cost	Co financing
Optimizing development of small hydel resources in hilly regions	UNDP	MNES	5	7.5	7.5	Rs 224.8 m by GoI
Bio-energy from industrial, municipal, and agricultural waste	UNDP	MNES	3	5.5	5.5	Rs 142 m by GoI
Renewable resource management	World Bank	IREDA	7	430	26	IDA $ 100 m IBRD: $ 75 m SDC: $ 4 m DANIDA: $ 50 m Local: $ 175 m
Greenhouse gas pollution prevention project	USAID	MNES/ NTPC/ IDBI/ IREDA	5	19		

As will be noted, the Renewable Resource Management is the only significant investment project. While a part of the USAID project is classified as an investment project for bagasse cogeneration, the scale of the project is relatively small. The other projects are primarily technical assistance projects.

While there is a need to enlarge the participation in the implementation process within India, the purpose of this paper is to initiate a discussion within Government agencies in India on measures that need to be implemented in India if the country is to contribute to the global efforts at reducing climate change risk. It is hoped that it would be possible to identify attractive *investment options* which be eligible for GEF funding and, simultaneously, further sustainable development objectives of the country. It is important for the concerned Government agencies that realise that GEF offer an opportunity to find financing for a certain category of projects[5] for which funding would otherwise be difficult. At the same time, there would be strong competing demand for financial resources of the GEF and the success of efforts would be determined by the quality of the proposal and its relevance to the mandate of the GEF.

5. The generic and specific eligibility criteria for the global warming area is summarized in Annexure 1.

Alternate Energy Project

The aim of the project is to further the commercialization of windfarm power generation and photovoltaics (PV) in India. The GEF project, together with the small hydro component of the associated World Bank financed *Renewable Resources Development* project, supports the creation of commercial markets for alternative energy technologies by strengthening institutional capability (particularly of the Indian Renewable Energy Development Agency) in India to foster private sector participation in renewable energy development.

The windfarm development component would involve financing of about 85 MW of wind generators largely by the private sector. Of the estimated financing requirement of Rs 3320 million (US$ 125 million), the GEF grant would be at least US$ 13 million. Bilateral (DANIDA) assistance of US$ 50 million is expected in the project.

The five year solar PV component involves developing a marketing programme leading to deployment of 2.5 to 3 MW of PV systems for a range of applications including lighting, water pumping and rural community and domestic use. Of the estimated financing requirement of Rs 1480 million (US$ 55 million), the GEF is expected to provide US$ 10 million. Swiss (SDC) bilateral assistance of about US$ 2 million is also expected. The project is directed largely towards generating a market for the PV lanterns and 80% of the line of credit is to be provided for this purpose. This component of the project is to be implemented through the establishment of a revolving fund for concessional consumer financing and associated marketing infrastructure.

Table 2. Financing of the *Alternate Energy Project*

	IDA	GEF	Bilateral	Investor	IREDA	Total
Small hydro	70			24		94
Windfarms	15	13	50	31	16	125
Solar PV	30	10	2	13		55
Technical assistance		3	2		1	6
Total	115	26	54	68	17	280

Source: *India: Alternate Energy Project*, The World Bank.

UNDP/GEF India Hilly Hydro Project

The UNDP/GEF India Hilly Hydro Project is a 42 month, Rs 45 crore (US$ 15 million technical assistance project which seeks to develop:

- a national strategy and a master plan with detailed investment proposals for the optimum utilization of small hydel resources of the Himalayan regions;
- a package of commercially viable and environmentally sound technologies on the basis of installing and commissioning of twenty demonstration units at various selected places for generation and the use of and the use of small hydel power to develop appropriate models for ownership, managements and maintenance of the small hydel projects through a people centered and participatory approach.
- institutional and human resource capabilities, from local to national levels, needed for the

execution/ implementation of the project and for sustainable development of the mini-micro hydel sector in hilly regions.

The project is being implemented by a Project Management Cell within the Institute (TERI) and will be responsible for the implementation of the project.

Greenhouse Gas pollution Prevention Project (GEEP)

The five year, US$ 19 million project, under the Seventh Trance (FY94) of *USA GEF Parallel Cofinancing*, seeks to reduce the greenhouse gas emissions by focussing on efficient coal technologies and to promote bagasse based cogeneration in sugar mills in India.

The Efficient Coal Conversion (ECC) of the GEEP

CO_2 reduction is aimed to be reduced primarily through technical assistance and institutional strengthening to allow power utilities and energy intensive industries to improve coal based system efficiencies. In order to achieve this, US$ 4 million has been provided to set up the Centre for Power Efficiency and Environmental Protection (CenPEEP) at the National Thermal Power Corporation. CenPEEP is expected to act as a national resource centre for supporting the power utilities in India for the purpose of efficiency improvement, environmental protection and transfer of environmentally friendly coal conversion technologies for power and industrial processes. In addition, CenPEEP will focus on the deficiencies of power generating facilities with low efficiencies and examine technology options for new coal-fired plants. CenPEEP will also identify and support implementation of measures for reduction of CO_2 through improvement of coal utilization efficiencies. The ECC also has a provision for US$ 3 million for financing the incremental costs of investments to demonstrate the feasibility of different technologies.

Alternative Bagasse Cogeneration (ABC)

This component of GEEP aims to demonstrate and promote the commercialization of bagasse based[6] cogeneration plants in association with the sugar industry. With the help of financial institutions and the private sector, the project hopes to leverage investments that are additional to the incremental costs of bagasse cogeneration plants. To achieve the stated objectives, the ABC has a US$ 3 million technical assistance component for a 5 year period. Managed by a Project Support Unit at the Technology Department of the Industrial Development Bank of India (IDBI), the technical assistance component will help identify, formulate and develop bagasse cogeneration projects which can then be financed by the investment component of the ABC. The US$ 9 million investment component of the GEEP is meant to cover the incremental costs of investments and to "buy down" the effective interest rate of debt in advanced bagasse cogeneration projects.

Project financing

The estimated financing requirement due to the incremental costs of the project (both the Efficient Conversion of Coal (ECC) and the Alternative Bagasse Cogeneration (ABC)), is estimated at US$ 12 million. IREDA and IDBI (Industrial and Development Bank of India) will administer the credit for the ABC component while IDBI will be responsible for the ECC. Technical assistance and

6. The use of supplemental biomass, which includes cane field trash, other agro-industrial residues such as rice husk, straws, etc., fuelwood from plantations on marginal land and stored surplus bagasse, will also be encouraged by the candidate sugar mills as a part of the project.

institutional strengthening will receive the remaining US$ 9 million. US$ 4 million of the TA component will be for ECC for stimulating pre-investment support to help stimulate and catalyse investments.

Bio-energy from Industrial, Municipal and Agricultural Waste

The US$ 5.5 million technical assistance project funded by the UNDP/GEF hopes to contribute in controlling emissions of methane from a wide range of wastes from the industrial, municipal and agricultural activities. Through the project, the Ministry of Non-conventional Energy Sources (MNES) hopes to use (in wherever necessary, develop) state-of-the-art high rate biomethanation technology. The objectives of the project also include the development of a national master plan, including investment programme, for generation and utilization of bioenergy based on high rate biomethanation processes

Cost Effective Options for Limiting GHG Emissions Project

The US$ 1.5 million technical assistance UNDP/GEF funded project, to be executed by the World Bank, envisages

- coal beneficiation
- improving efficiency of energy equipment and systems such as boilers, motors, pumpsets, buildings (including lighting systems), etc., and
- strengthening institutional capability for the above two measures and to formulate investment options in the two sectors.

The Ministry of Environment and Forest is to supervise the project while the Ministry of Coal and Ministry of Power are to be responsible for the two study components.

Biodiversity: Ecodevelopment Project

The US$ 30 million, World Bank implemented project on ecodevelopment (Ecodevelopment I) was approved by the GEF Council in May 1995. The project is expected to conserve biodiversity by implementing the ecodevelopment strategy in and around eight protected areas (PAs) and includes support for preparing future biodiversity projects. It has a duration of five years. Those PAs selected include gazetted and proposed parks and sanctuaries as well as land within a 2 km radius. Using a process of consultation involving both NGOs and the State Governments, the MOEF selected these PAs from a list of areas where the threats to biodiversity stem from rural dependency. Other selection criteria included biodiversity importance, biogeographic representation, and likelihood of success. The success factor in turn took into consideration extent of human pressures, PA management capacity, existing infrastructure, accessibility, state and national government support, state government responsiveness to community and NGO involvement in forest management. The identified PAs are Buxa (West Bengal), Gir (Gujarat), Nagarhole (Karnataka), Palamau (Bihar), Pench (Madhya Pradhesh), Periyar (Kerala), Ranthambore (Rajasthan), and Simlipal (Orissa). The costs which have been tentatively estimated and are likely to be extensively revised prior to the appraisal, are set at US$ 83 million (of which the GEF component is US$ 30 million).

The main objectives would be:

(a) to improve PA management, increase opportunities for local participation in PA management activities and decisions, and reduce negative impacts of PAs on local people;

(b) to reduce negative impacts of local people on biodiversity and gain support of local people

for conservation;

(c) to develop more effective and extensive upport for PA ecodevelopment;

(d) to prepare other future biodiversity projects[7],[8]; and

(e) to ensure effective management of this project.

The elements which appear to have been addressed during the formulation of this project proposal are the active involvement of the NGO community (including coordination of the project preparation, coordination has extended to national/state NGOs), strong interaction between government (including Government institutes) and NGO community (both national and state/project site NGOs), and the fact that it is country driven and involving a participatory process (involved extensive meetings at various levels and participatory rural appraisals). The project proposal also extends to an evaluation of the negative impacts the people on the PAs and that of the PAs on the people.

---

7. The list of other biodiversity project concepts for future Global Environment Trust (GET) and IDA funding, submitted as part of Ecodevelopment I are:
(i) Large Scale Ecodevelopment Project II; (ii) Freshwater Wetlands Project; (iii) Coastal Biodiversity Project; (iv) Biodiversity Information Project and (v) Ex-Situ Conservation Project. All these projects have identified the individual institutions to be associated. These are to be prepared prior to the Appraisal Mission visit scheduled for April 1995.

8. For the purpose of preparing the projects (identified as project concepts) in the Ecodevelopment project I, funding additional to that obtained in the Ecodevelopment I project, in the form of Preinvestment Feasibility grants are to be applied for.

Annex C - Attachment 1

Global Environment Facility Trust Fund
Contributions (in millions)

Contributing Participants	SDR Amounts	National Currency Amounts[a]	Contributing Participants	SDR Amounts	National Currency Amounts[a]
Group I[b c]			**Group II[b]**		
Australia	20.84	42.76	Brazil	4.00	§
Austria	14.28	231.51	China	4.00	§
Canada	61.78	111.11	Côte d'Ivoire	4.00	§
Denmark	25.08	§	Egypt	4.00	§
Finland	15.45	124.00	India	6.00	
France	102.26	806.71	Mexico	4.00	§
Germany	171.30	394.76	Pakistan	4.00	
Italy	81.86	159,803.25	Turkey	4.00	§
Japan	295.95	45,698.09			
Netherlands	50.97	§	**Group III[b]**		
New Zealand	4.00	10.35	Ireland	1.71	1.64
Norway	21.93	216.42			
Portugal	4.00	§	Other*	6.48	
Spain	12.36	2,180.10	Unallocated**	42.83	
Sweden	41.60	450.04			
Switzerland	31.97	§	TOTAL in SDRs	1,443.59	
United Kingdom	96.04	89.55	TOTAL in US$ ‡	2,022.52	
United States	306.92	430.00			

a.	Calculated by converting the SDR amount to the national currency using an average of daily exchange rates over the period February 1, 1993, to October 31, 1993.
b.	Group I consists of non-recipient donors that participated in the replenishment meetings. Group II consists of recipient donors that participated in the replenishment meetings. Group III consists of other donors.
c.	The following table shows background information and explanations regarding the breakdown of Group I contributions according to contributions based on IDA 10 basic shares, Supplementary Contributions towards meeting adjusted IDA 10 shares, and additional Supplementary Contributions.
*	Includes the enhanced value of contributions through accelerated encashments, not included in the figures above and new and additional contributions made to the GET and expected to be available for the GEF II.
**	It is expected that other donors will make contributions amounting to US$60 million (SDR 42.83 million), which represents 3% of the original replenishment target of US$2,000 million.
§	These countries are denominating their contributions in SDRs.
‡	Calculated by converting the SDR amount into US$, using an average of daily exchange rates over the period February 1, 1993, to October 31 1993.

Explanatory Note: Donors agreed that a core replenishment of US$ 2 billion (SDR 1427.52 million) should be built on IDA 10 shares. Since IDA 10 basic shares of non-recipient donors participating in the replenishment meetings add up to 87.81% in order to avoid a funding gap, IDA 10 basic shares were adjusted on a pro-rata basis to increase the shares of non-recipient donors participating in the replenishment meetings to 95%, with the remaining 5% set aside for non-recipient donors not participating in the replenishment discussions, as well as for recipient donors. Donors agreed to aim to make basic contributions to the GEF Trust Fund in accordance with these adjusted shares. The first column shows contributions based on IDA 10 basic shares. Column 3 shows additional contributions towards reaching the adjusted IDA 10 shares.

Contributions to the Global Environment Facility Trust Fund
Background Information

Contributing Participants	Contributions based on IDA 10 Basic Shares		Supplementary Contributions towards meeting adj. IDA 10 shares SDR m	Additional Supplementary Contributions SDR m	Total Contributions	
	SDR m	%[a]			SDR millions	National Currency millions[b]
Australia	20.84	1.46%			20.84	42.76
Austria	12.85	0.90%	1.05	0.37	14.28	231.51
Canada	57.10	4.00%	4.68		61.78	111.11
Denmark	18.56	1.30%	1.52	5.00	25.08	§
Finland	14.28	1.00%	1.17		15.45	124.00
France*	100.21	7.02%	2.05		102.26	806.71
Germany	157.03	11.00%	12.86	1.41	171.30	394.76
Italy	75.66	5.30%	6.20		81.86‡	159,803.25
Japan	266.95	18.70%	21.86	7.14	295.95	45,698.09
Netherlands	47.11	3.30%	3.86		50.97	§
New Zealand	1.71	0.12%	0.14	2.15	4.00	10.35
Norway	20.27	1.42%	1 66		21.93	216.42
Portugal	1.71	0.12%	0.14	2.15	4.00	§
Spain	11.42	0.80%	0.94		12.36	2,180.10
Sweden	37.40	2.62%	3.06	1.14	41.60	450.04
Switzerland	24.84	1.74%	2.03	5.10	31.97	§
United Kingdom	87.79	6.15%	7.19	1.06	96.04	89.55
United States	297.78	20.86%	9.14		306.92	430.00

a IDA 10 basic shares as agreed by IDA deputies in December 1992.
b Calculated by converting the SDR amount of the total contribution to the national currency, using an average of daily exchange rates over the period February 1, 1993 to October 31, 1993.
‡ This SDR amount includes the effect of early encashment.
§ These countries are denominating contributions in SDRs.
* At the 12-month exchange rate, from November 1, 1992 - October 31, 1993, the total contribution of French francs (FF) 806.71 million to the GEF Trust Fund is equivalent to SDR 103.58 million. The IDA 10 basic share is SDR 100 50 million; hence the supplementary contribution is SDR 3.08 million.

Memorandum Item: In addition to the above contributions, the following countries have indicated their intention to provide co-financing or parallel financing on grant or concessional terms in support of the GEF: Austria (SDR 6 million); Denmark; France (FF 440 million); and Norway.

Sustainable development

The UK Sustainable Development Strategy, which met a commitment entered into after the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, emphasised that the use of energy is a key issue for sustainable development. Today's energy use is based mainly on the burning of non-renewable fuels. The concept of sustainable development does not imply that all non-renewable resources must be preserved for all time. The key is the need, in due course, to find suitable replacements. Despite the economic growth of the last few decades and the use of energy this has involved, the world's stocks of all primary fuels, measured in terms of proved reserves, are now larger than ever before, and there are more to be discovered. There is no reason to believe that the availability of resources will of itself impose constraints on the process of economic development in the foreseeable future.

ENERGY AND THE ENVIRONMENT

The activities of the energy industries have the potential to affect the environment in a variety of ways In practice, regulations and other environment policy instruments serve to limit damage But the major potential causes of concern that relate to energy are :

- **Greenhouse gas emissions:** Carbon dioxide (CO_2) emissions contributed most of the direct anthropogenic intensification of the natural greenhouse effect in 1990. Fossil fuel burning probably accounts for almost all of this. The second most significant greenhouse gas is methane: coal mining and oil and gas production, distribution and use together account for about a quarter of current emissions.
- **Acid deposition:** Man-made sulphur dioxide (SO_2) and oxides of nitrogen (NOx) add to the natural acidity of rain. Virtually all UK SO_2 emissions are energy related and about 70% of them are estimated to come from power stations Road and other transport contributes about half of UK NOx emissions, and other fossil fuel burning the rest, with power stations contributing 25%.
- **Ambient Air Quality:** Local air quality is affected by emissions of SO_2, NOx, VOCs, and particulate matter Nearly 40% of estimated VOC emissions are from transport and industrial use, and about 13% are from the extraction and distribution of fossil fuels.
- **Water pollution:** Power plants, industrial cooling systems, abandoned mines, and onshore oil wells all have the potential to contribute to water pollution.
- **Maritime pollution:** Accidental oil spills may foul beaches and kill seabirds and other marine life
- **Land use:** The processes of electricity generation and distribution may call for the use of scarce or sensitive land and countryside. These impacts are associated with both old and new forms of generation Coal mining can also have adverse effects on the land.
- **Radiation and radioactivity:** Although virtually free from greenhouse and acid gases, nuclear energy does produce radioactive wastes. Disposal of these, and decommissioning of redundant facilities, requires careful supervision.
- **Solid waste disposal:** The use of scrubber systems to clean sulphur emissions from coal-fired power stations is a potentially large source of solid waste in the form of gypsum. In practice, much of the gypsum is used to make wallboards and other plaster products. Similarly, much of the furnace-bottom ash from coal-fired power stations is used in building materials. Other solid residues are land-filled wherever possible as part of reclamation schemes. Colliery spoil can be disposed of in a similar manner.

Further details of many of these environmental impacts are contained in the Digest of Environmental Protection and Water Statistics, No 16, 1993, HMSO.

1.10 However, the environmental issues related to energy production and use have to be addressed. These include climate change, regional air quality issues, concerns relating to the extraction, conversion, and transmission of fuels, and transport-related impacts (see Box). One way of ensuring that energy use is kept on a sustainable path is to supply energy in ways which have less environmental impact. Another is to encourage consumers to meet their needs with less energy input, through increased energy efficiency. A third is to ensure that prices charged for the different kinds of energy reflect the full cost of the resources consumed, including the environmental and social costs of their extraction, generation or refinement, distribution, and use. These approaches are complementary rather than alternatives.

1.11 Environmental issues feature prominently on today's international energy agenda, and provide the basis for action at a national level. The UK has already reported on its progress towards Sustainable Development and its programme on Climate Change. There are initiatives in the European Union and the United Nations Economic Commission for Europe (UNECE) towards reducing acid emissions from industrial plant and transport. Other new initiatives are directed towards controlling emissions of Volatile Organic Compounds (VOCs), which can damage plant and animal life by contributing to the formation of extra ozone at ground level. There are plans to assist the countries of central and eastern Europe and the Former Soviet Union (FSU) to reduce the dangers associated with Soviet-designed nuclear reactors. The UK also funds a large number of projects in developing countries to improve the efficiency with which energy is supplied, distributed, and used.

Energy Markets

1.12 In responding to the fundamental policy concerns outlined above, the Government's role is to provide the right legal and regulatory framework within which energy can be made available to users. It does not itself control the supply of energy or attempt to impose any all-embracing plan about how much energy, and what kind of energy, should be produced or consumed. Experience suggests that the uncertainties of supply and demand, of technological change, and of the behaviour of individuals and companies, will doom such plans to failure.

1.13 The Government believes that its aim will be best achieved through competitive markets, which are the most effective means of balancing demand and supply for energy, as they are for other commodities. Competition exposes investment decisions to the rigorous test of the market, and drives costs down. It forces businesses to address and meet the needs of their customers, and empowers customers to get the best deal. The privatisation of the electricity industry has been accompanied by a radical restructuring, while there is still some way to go, competition is developing and providing benefits for the customer. The restructuring of the gas industry has so far been more limited, but

a period of progressive liberalisation is now planned. Independent regulators have been established for gas and electricity to encourage the development of competition and to protect the interests of consumers. The privatisation of the coal industry is under way.

The aims of liberalisation are to secure greater efficiency and reduced cost, while at the same time encouraging cost-reflective pricing. The intention is, by 1998, to fully open domestic markets to competition, following the prior steps in industrial markets. Many people should then have the freedom to choose their energy suppliers, to pick which company to buy their gas or electricity from, and to choose the trade-off between prices and service that best meets their individual requirements. More sophisticated metering devices and easier methods of payment are likely to accompany the development of competition. New suppliers will have to make their own arrangements with the producers of fuel, whether electricity generators or natural gas producers, and to devise their own means of dealing direct with customers. There are substantial gains to be had as competitive pressures drive consumers to make better bargains with energy suppliers, and the latter to tailor their services to individual customer needs, to improve their internal efficiency, and to innovate. The charges for the use of common network facilities will remain under regulatory supervision.

1.15 At present, UK energy markets are undergoing the transition from domination by state-owned monopolies towards a more competitive environment. The process will take full effect over a period of several years. But the direction of the change is clear, and an underlying theme of much of this Report is the adaptation of energy companies to an increasingly competitive energy market. The UK is to a large extent leading the rest of the world in exploring the possibilities of real competition in this way.

1.16 The need to reconcile the apparently conflicting objectives of encouraging competition, so as to drive energy costs and prices down, and of ensuring that environmental objectives are met, which may have the effect of increasing energy prices, is one of the issues discussed in Chapter 6 (see paragraphs 6.17 to 6.23).

FOUR RECENT GOVERNMENT PUBLICATIONS

The Prospects for Coal:
Conclusions of the Government Coal Review
("The Coal Review White Paper"),
Cm 2235, March 1993.

Competitiveness: Helping Business to Win
Cm 2563, May 1994.

Sustainable Development: The UK Strategy,
Cm 2426, January 1994.

Climate Change: The UK Programme,
Cm 2427, January 1994.